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NORTH SEA PILOT

PART IV. 1878

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NORTH SEA PILOT.

PART IV.

RIVERS THAMES AND MEDWAY, AND THE SHORES OF THE NORTH SEA FROM CALAIS TO THE SKAW.

THIRD EDITION.

COMPILED FROM VARIOUS AUTHORITIES.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

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TO THIRD EDITION.

THE North Sea Pilot, Part IV., contains Sailing directions for the Rivers Thames and Medway, the coasts of France, Belgium, Holland, Hanover, and Denmark, from cape Gris-nez to the Skaw or Skagen.

The directions for the coast of France are from the Pilote Français of Beautemps-Beaupré and Givry ; those from Dunkerque to the Elbe are by Staff Captain E. K. Calver, R.N., from the charts of Ryk and Van Rhyn, the Dutch Ariel by Modera, and other authorities, as well as from his own observations ; whilst from the Elbe to the Skaw the directions were taken chiefly from the Danish Pilot by the late Admiral Zahrtmann, 1853.

The original work was prepared by Staff Commander J. Penn, of the Hydrographic Office, in 1863 ; the present edition has been revised by Captain G. H. Inskip, R.N., from the latest surveys, official notices, and information furnished by local authorities.

F. J. E.

Hydrographic Office, Admiralty, London,
April 1878.

IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.

THE DISTANCES ARE EXPRESSED IN SEA MILES OF
60 TO A DEGREE OF LATITUDE.

A CABLES' LENGTH IS ASSUMED TO BE EQUAL TO
100 FATHOMS.

THE SOUNDINGS ARE REDUCED TO LOW WATER OF
ORDINARY SPRING TIDES.

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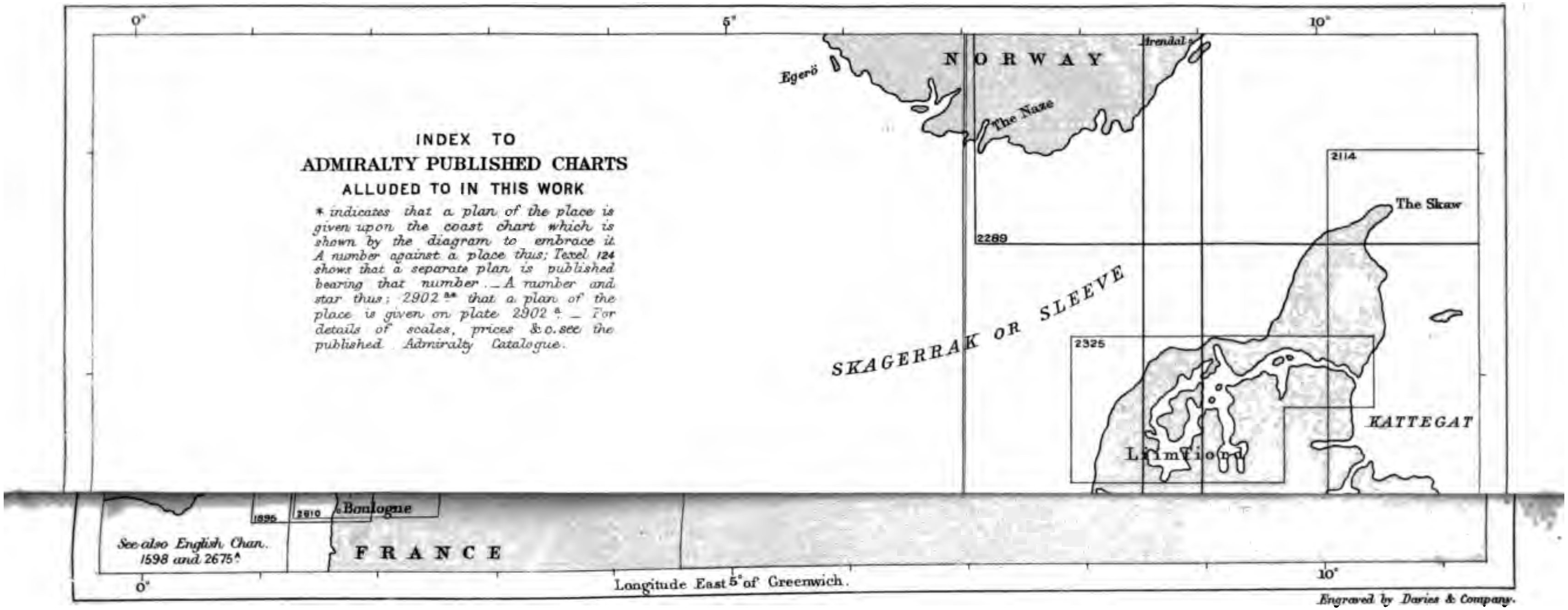

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** indicates that a plan of the place is given upon the coast chart which is shown by the diagram to embrace it. A number against a place thus; Texel* **124** *shows that a separate plan is published bearing that number. — A number and star thus; 2902^{a*} that a plan of the place is given on plate 2902^{a}. — For details of scales, prices &c. see the published Admiralty Catalogue.*

Engraved by Davies & Company.

NORTH SEA PILOT.

PART IV.

CHAPTER I.

THE NORE TO LONDON BRIDGE.

Variation, 18° 20′ to 18° 40′ West in 1878.
Decreasing about 9′ annually.

The THAMES, the most important, though not the largest river in Great Britain, rises from three sources, which unite near Lechlade, where the counties of Gloucester, Wilts, Berks, and Oxford border on each other, and where it becomes navigable for barges. Thence winding its course between low and fertile banks, and receiving several tributaries, it takes a general E. by S. direction for about 180 geographical miles to its estuary at the Nore, where it unites with the waters of the Medway 41 miles below London bridge. Its breadth at London bridge is 290 yards; at Woolwich, 490; at Gravesend, 850; and 3 miles below, 1,290 yards.

The river with its affluents drains an area of upwards of 6,000 square statute miles; its height at Thames-head bridge is 376 feet above the sea level, at Lechlade 243 feet, showing an average fall in this part of its course of 6 feet a mile; below Lechlade the average fall is no more than 2 feet 3 inches; and between London bridge and the Nore the fall is but one inch to the mile.

The Thames from London to Gravesend is retained within its present limits by large embankments. The surface of the river at high water is several feet higher than the surrounding country, so that it is in effect, in many parts, an aqueduct raised and supported between artificial banks. The date of these embankments is unknown; the probability is that they are the work of the ancient Britons under Roman superintendence; that they are the result of skill and bold enterprize not unworthy of any period is certain.*

The tide flows up the Thames from the Nore for a distance of 58 nautical miles, till it is stopped by a weir at Teddington, beyond Richmond, 20 miles above London bridge; but for this weir high water of a spring tide would reach 1½ miles beyond. Before the removal of old London bridge in 1833 the sectional area of the river below Trinity high water level, as stated by Mr. George Rennie, was 8,700 superficial feet, after the removal 17,600 feet. The greatest fall through the arches of the old bridge was 3 feet 6 inches; in the year 1834 it was reduced to 5 inches. By the removal of the old bridge and by dredging the tidal wave has, it is said, been much accelerated, and it is highly probable; but there has not been a sufficient series of observations to establish the fact. Hitherto the following times and heights of high water have been generally adopted:—At the Nore 12h. 30m.; at Gravesend 1h. 10m.; at Woolwich 1h. 37m.; at London docks 1h. 53m.; at London bridge 1h. 58m. The mean rise of the tide at springs at the Nore is 15½ feet: at Gravesend 17½ feet; at Woolwich dockyard 18¼ feet: at London docks 20¾ feet.

---

* The Thames from Sea reach to London bridge has been corrected and revised by *Captain* E. Burstal, R.N., Secretary to the Thames Conservancy, 1877.

The Thames is navigable at high water for the largest ships as far as Deptford, and for vessels of 27 feet draft up to London bridge.

The regulation of the river is, by Act of Parliament, under a permanent body of 23 Conservators, whose jurisdiction extends from Cricklade in Wiltshire, about 151 miles above London bridge, to a line drawn from the entrance of Yantlet creek to about a mile eastward of Leigh on the Essex shore of the river; each extremity of this limit being marked by a square stone. The limits of the port of London are included between a line extending from the distance of 4 miles from the North Foreland lighthouse to a distance of 3 miles from the Naze tower on the coast of Essex on the east; and London bridge on the west.

Having in the two concluding chapters of the North Sea Pilot, Part III., brought a ship up by the several entrances of the Thames to the Nore, we proceed here to take her up the river to Gravesend and London.

The different bends of the river are called reaches, of which there are eighteen between the Nore and London bridge, and they will be described in ascending consecutive order.

SEA REACH extends from the Nore to Lower Hope point, on the Kentish shore, and takes a general W.N.W. direction for about 13 miles, with extensive marshes fronted by shoal flats to a considerable distance on both sides of the river, but having a deep water channel between them. The distance between the isle of Grain on the southern or Kentish shore, and Shoeburyness on the Essex side, is 4¼ miles across, but this distance is contracted by the shoals to a breadth of 1¼ miles, and in the western part of the reach the channel is narrowed to half a mile in breadth.*

---

* See Admiralty charts:—North Foreland to the Nore, No. 1,607, scale, m = 1·4 inches; Gravesend to the Nore, No. [illegible], scale, m = 2·0 inches; and Sheet 3, Sea reach, No. 1,185, scale, m = [illegible] inches.

The isle of Grain at the confluence of the Thames and Medway, is low, flat, and protected from inundation by strong embankments. Its shores are muddy, affording no landing except at high water. It is about 2½ miles in length north and south, 2 miles in extreme breadth east and west; and is formed on the east by Yantlet creek, which takes a winding course between the two rivers. On the eastern side of the entrance to the creek is the London stone, marking the limit to which the jurisdiction of the Conservators over the river extends; and a short distance westward is the small narrow hook-shaped isle of Yantlet. Slough fort is erected on the slope of the hill within Yantlet isle.

NORE SAND and YANTLET FLATS.—Of the shoals bordering the whole of the southern shore of Sea reach, the easternmost is the Nore sand, a narrow ridge, dry at low water, having its eastern extremity at about 3 miles from the nearest part of Grain islet, and about 2¼ miles from the Cheney rocks house in Sheppey. At rather more than half a mile east of it is the Nore light-vessel. The northern edge of the sand takes a W.N.W. direction, is steep, and has a black and white vertical striped buoy on it, in 16 feet, bearing N.W. by W. ¾ W., rather more than 2 miles from the light-vessel.

Between the western part of the Nore sand and the shoal extending eastward from Grain islet, is a swatchway used by small vessels and barges bound to and from the Thames and Medway. To facilitate its navigation a black and white chequered buoy, called the Jenkin, is moored at the outer edge of the sand N.W. by W. ½ W. 1¾ miles from the Nore buoy.

To the westward of Jenkin buoy, and in continuation of the Nore sand, are the Yantlet flats, fronting the creek of that name at a distance of three-quarters of a mile; and at the western extreme is Yantlet spit, half a mile off which in an eastern direction is a black and white vertical striped buoy, in 18 feet, N.W. by W. ¼ W. 1¾ miles from Jenkin buoy. A spit extends about a quarter of a mile eastward of the Yantlet buoy, having 16 and 18 feet water over it.

The NORE LIGHT-VESSEL is moored in 22 feet at low water, at about half a mile eastward of the extremity of the Nore sand, and exhibits a *revolving* white light attaining its greatest brilliancy every *half minute*. The light is elevated 35 feet above the water, and should be seen in clear weather from a distance of 10 miles. A gong is sounded in foggy weather,—and a gun fired if a vessel is seen standing into danger. The vessel lies with Sheerness middle buoy W. by S. ¼ S. one mile, and Garrison point on the same bearing, 3¼ miles; Minster church, Sheppey, in line with the east end of a triangular field, called Mizen hedge, S.S.W.; the Mouse light-vessel E. ½ N., nearly 7½ miles; Southend pier head

[illegible]

[illegible]

[illegible] distant 4 miles; and the [illegible] 2½ miles.

[illegible] from the low north point of entrance to the [illegible] S.W. by W., and at the [illegible] of moderate height, named Thorp [illegible] half a mile, when it again becomes low for [illegible]. The tide ebbs off a considerable [illegible] barges may land at high water on a [illegible] at high water mark.

[illegible] Government works for exercising and [illegible] Artillery has been established with barracks and officers' quarters. By Act 25 & 26 Vict. c. 36, of the 17th July 1862, vessels are forbidden to anchor or ground on that part of the Maplin sands eastward of Shoeburyness, which is now used and buoyed off for the artillery ranges, unless from stress of weather, under a penalty of forty shillings and not exceeding five pounds for every offence. The ordinary ranges of the guns are between 200 and 1,200 yards, but the extreme range may occasionally be nearly five miles.

SOUTHEND is a watering place, consisting of modern residences, presenting a handsome appearance from the river. A portion of the town is built upon elevated ground faced with cliffs, from the eastern extremity of which a pier constructed upon piles projects upwards of a mile in a southerly direction, over hard sand to a depth of 10 feet at low water. Southend is connected with London by railway.

The Southend flat, nearly the whole of which dries at low water, is a continuation of the western part of the Maplin, following the direction of the shore, from which it extends from one to 1¼ miles, and is steep-to The eastern portion is somewhat irregular. To the westward of Southend the flat unites with the shoals off Leigh creek.

LIGHT.—A *fixed red* light is shown all night from the extremity of Southend pier.

Buoys.—The south-eastern edge of Shoeburyness flat or Maplin sand is marked by four black buoys. The East Shoebury buoy lies in 6 fathoms at low water springs, with Hamlet mill in line with a large house next west of Shoebury preventive station, bearing N.W. by W. ¼ W.; Canewdon church in line with a small black building, westward of a large farm N.N.W.; Admiralty west buoy East, distant half a mile and in line with east buoy; South Shoebury buoy W. ½ N., distant 1$\frac{6}{10}$ miles.*

The South Shoebury buoy lies about midway between the East and Middle Shoebury buoys in 5¼ fathoms at low water springs, with South church in line with the west end of a large house, next west of Shoebury preventive station, bearing N.W. ¼ N.; Middle Shoebury buoy W. by N. ¼ N. above 1¾ miles.

The Middle Shoebury buoy lies in 3 fathoms water, with Hamlet mill bearing N.W. and in line with the west end of Southend terrace; Shoeburyness N.N.W. ¼ W. 1½ miles; and the Nore light-vessel S. by W. 1½ miles.

The West Shoebury buoy lies in 4 fathoms water with Hadleigh castle, twice its breadth open of Southend jetty bearing N.W. ¼ W.; Middle

---

* About half a mile eastward of East Shoebury black buoy is the Admiralty measured mile at which the steam vessels fitted at Sheerness and Chatham test their speed. It is marked at each end by two beacons, with triangular heads painted red, and by two red beacon-buoys on the edge of the sand.

Shoebury buoy E.S.E. 2 miles; Nore light-vessel S.E. by S. 3¾ miles; and River or Leigh Middle east buoy N.W. by N. ½ mile nearly.

About 1½ cables W.N.W. from Southend pier there is a black buoy marking the edge of Leigh spit.

The LEIGH MIDDLE is a sand which is about 2½ miles in length, and at its western end half a mile in breadth. On its shoalest part for 1½ miles there are only from 7 to 11 feet at low water, and on other parts of the sand from 11 to 15 feet, but it is subject to frequent changes. Its eastern extremity in 18 feet lies S.W. by W. ½ W. above a mile from Southend pier head, and from thence it extends N.W. ½ W. to the same depth on its western end. The southern edge of the sand is 1½ miles from the Essex shore, runs nearly parallel to it, and is marked by two buoys. Between the northern part of this sand and the edge of the Southend flat there is a deep water channel from a half to a quarter of a mile wide, narrowing to the north-west between the Leigh Middle and the Chapman sand, to about 1½ cables, which is called the Leigh channel.

Buoys.—River or Leigh Middle east buoy is striped black and white horizontally, with a staff and diamond, and lies in 17 feet at low water, with Prittlewell church one-third its height on the east end of Southend terrace bearing N. ¼ E.; West River Middle buoy N.W. by W. 1¾ miles; Shoeburyness buoy E. by S.; and the Nore light-vessel S.E. above 3½ miles.

West River Middle buoy, black, in 17 feet, with Shell Haven house in line with Scar house bearing W.N.W.; Prittlewell church tower in line with the east end of a grove of trees next west of Hamlet mill N.N.E. ¼ E.; River Middle east buoy S.E. by E. 1¾ miles nearly; and the Jenkin buoy S. ¼ E. about 1¼ miles.

YANTLET MIDDLE GROUND.—Nearly in the middle of the fairway channel between the Leigh Middle and the Yantlet flats, are two narrow patches extending in the direction of the channel for nine-tenths of a mile, having 17 and 18 feet over them at low water. From the east end of those patches the West River Middle buoy bears N. by W. ½ W. distant three-quarters of a mile; the extremity of Southend pier N.E. ¾ N.; and the Jenkin buoy S. by W. ¾ W. From the west end the West River Middle buoy bears N.E. by E. ½ E., distant six-tenths of a mile, and Jenkin buoy S.E. by S. ½ S. 1¼ miles. The narrowest part of the channel, between these patches and Leigh Middle, is about 3½ cables wide, and between them and Yantlet flats rather more than half a mile.

LEIGH.—At 2¼ miles westward of Southend is the small town of Leigh; the coast between consisting chiefly of low cliffs. On the shore at a mile eastward of the town is the Crow stone or London stone, which marks the north shore eastern termination of the conservatorial jurisdiction of the river. Leigh stands on the acclivity of a hill, and its ancient church with square tower is conspicuous. The town is chiefly inhabited by fishermen, and has upwards of 150 boats employed in shrimp and oyster trade. Here are likewise nurseries or parks for breeding oysters, for which the shore seems well adapted. Behind and to the north-west of it the land is elevated, and at 1⅓ miles in the latter direction is the village of Hadleigh, to the southward of which are the ruins of Hadleigh castle, picturesquely situated on the summit of a hill. Nearly the whole of the space between the Leigh Middle and the shore of Leigh is a shoal, and to the westward is low marsh land through which the waters of the Thames find their way at flood tide.

Canvey island consists of about 3,500 acres of marsh land embanked all round, its eastern end is nearly a mile distant from Leigh. The approaches to Leigh and the creeks inside Canvey island are through narrow shallow channels, called the Slade and Ray gut, having a common entrance marked on its eastern side by a black buoy called the Leigh spit before mentioned. From Canvey point the low south shore of Canvey island takes a westerly direction for 2½ miles to the west end of Shell bank, where it forms a small bight, on the western side of which, at Stony point, is a beacon. Nearly half a mile westward of the beacon is Scar house and point; and three-quarters of a mile to the W.N.W. of the point is Hole or Holy haven, a narrow inlet with depths of 7 to 13 feet, in the entrance to a muddy creek forming the western side of Canvey island. Supplies of lobsters from Norway and Scotland are deposited here for conveyance up the river.

CHAPMAN SAND, the greater part of which is dry at low water, borders the shore of Canvey island. From Canvey point the sand extends to the eastward for 2 miles, covering the inner sands fronting the town of Leigh, and forming the western boundary of the entrance to the Slade, and Ray gut. This part of it is named Marsh End sand. At about half a mile southward of Canvey point, the Chapman sand is separated from Little Middle by a narrow channel carrying from 9 to 20 feet water. The southern edge of the Little Middle forms the northern boundary of the Leigh channel; its eastern extreme being 1$\frac{1}{10}$ miles from the shore. To the westward, the edge of the Chapman sand draws towards the shore. The Scar elbow, the southern edge of the sand off Stony point beacon, extends out about a quarter of a mile, and between this and Hole haven only a little more than a cable, and is steep-to.

LIGHT.—A lighthouse, 73 feet high, supported by screw piles and painted red, stands upon Chapman head, or within the edge of a bend in the sand, between Canvey and Stony points. It exhibits a *fixed* white light; but to the northward of the line of bearing of the River Middle east buoy, viz., S.E. by E. ¾ E. from the lighthouse, it shows *red*, which extends northward in the direction of Southend pier head. The light is placed at an elevation of 40 feet above high water, and in clear weather should be seen from a distance of 11 miles. A bell is sounded continuously during foggy weather.

Beacon.—On the marsh inland of Stony point, a quarter of a mile eastward of the Scar houses, is a beacon, 58 feet high, with a diamond-shaped head surmounted by a ball. The Chapman lighthouse, twice its length South of Shell bank and open North of Stony point beacon, is the leading mark along southward of the Leigh Middle.

Shell Haven.—The Essex shore from Hole haven to Mucking lighthouse, 2¼ miles westward, is bordered by a narrow mud bank, steep-to. At 1¼ miles from the former is an inlet, dry at low water, called Shell haven, having a house with some trees about it on the eastern bank, and on the western side of the entrance is the site of a proposed dock, to be called the "Thames Haven." A branch railway, that joins the London and Southend railway, here terminates at a landing place.

MUCKING LIGHTHOUSE stands on the north shore of the river about a mile westward of Thames haven pier, or 5 miles from the Chapman lighthouse. It is built on piles at the edge of the eastern part of Mucking flat, 200 yards from the keepers' houses, to which it is connected by a pile-way, and painted white with black band under the lantern. The light is a *fixed* white light, at an elevation of 40 feet above high water, and should be seen in clear weather from a distance of 11 miles. To the northward of a line bearing E. by S. ¾ S. from the lighthouse, or in the direction of the Scar elbow and Chapman sands; and to the westward of S.W. ½ W., or in line with the spit of the Ovens flat, it shows *red*. A stripe of *red* light is also shown to the S. by E. ¼ E. in the direction of the West Blyth buoy.

TIDES.—It is high water, full and change, at the Nore at 0h. 30m.; springs rise 15½ feet, and neaps 13 feet. At the light-vessel, although it is high water by the ground a few minutes earlier than at Sheerness dockyard, yet the stream runs up the Thames for half an hour after high water at the yard; by which time the water, perhaps, has fallen a foot, and in the same manner it rises a foot before the flood appears to run. The greatest velocity of the tides at springs is 3 miles an hour, and at neaps 2 miles. The flood sets to the westward fairly through Sea reach, and is most rapid in the narrowest part, between the Blyth and Chapman sands. There is a slack along the northern edge of the Blyth sand on the ebb, in which vessels bound up the river may navigate, keeping outside the Blyth buoys and using the lead. The direction of strong winds considerably affects both the times and the heights of high water, and the varying pressure of the atmosphere partially affects its height.*

DIRECTIONS.—From a quarter of a mile northward of the Nore light-vessel the direct course to the fairway in Sea reach between the Leigh Middle and the Yantlet flat is N.W. by W.; but as this course would probably lead over the Yantlet Middle ground in 18 feet at low water, vessels of large draught should steer N.W. ¾ W. until abreast the River Middle east buoy; when Chapman lighthouse twice its length south of Shell bank, and open northward of Stony point beacon, bearing about N.W. by W. ⅓ W., will lead in the deepest water between the 18 feet patches and the Leigh Middle ground.

Having passed the West River Middle buoy, a W. by N. ¾ N. course for about 5½ miles leads southward of the Chapman sand and Scar elbow, to abreast Hole haven, when a mid-channel course about W. by N. may be taken for the bend of the river between Mucking lighthouse and West Blyth buoy, and care must be taken not to bring Mucking lighthouse westward of W.N.W.

Or from the same position northward of the Nore light-vessel, a N.W. by W. ½ W. course will carry a vessel along the southern side of the reach, passing the Nore and Jenkins buoys on the port hand, and when nearly abreast of the latter buoy, bring Fobbing church, having an embattled tower steeple, between Shell bank and Chapman lighthouse, to bear N.W. by W., northerly, which will lead between the Yantlet flats and the 18 feet patches northward of it.

When at a distance of rather more than half a mile northward of the Yantlet black and white buoy, a course about W.N.W. will lead northward of the East Blyth buoy, and nearly up to the bend of the river, between Mucking lighthouse and West Blyth buoy, then edge to the southward in the centre of the river into Lower Hope reach.

AT NIGHT.—From a quarter of a mile northward of the Nore light-vessel, steer N.W. ¾ W., until the Chapman light bears N.W. by W. ⅓ W., then steer this latter course, keeping the Chapman white light in sight to avoid the Leigh Middle, and pass about 3½ or 4 cables southward of the light. Then steer about W.N.W. towards Mucking light, keeping the white light also in sight to avoid the Scar elbow. When at the distance of half a mile from the Mucking light, steer about W. by S., and a vessel will pass the narrow strip of *red* light that shows in the direction of the West Blyth buoy into Lower Hope reach.

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* The tidal range of the river Thames has of late years gradually increased, due to the removal of shoal beds and improvements on the banks; the tidal wave having thus freer scope. Admiralty Tide tables, pp. 113–114.

LOWER HOPE REACH extends in a south-west direction from Sea reach, between Mucking lighthouse on the northern shore, and the west end of Blyth sand on the southern, to Coalhouse point, where the river bends to the westward, between Tilbury fort and Gravesend. The land on either side is marshy, and from Mucking lighthouse the flat borders the whole of the western shore for about one-third the distance across the river; and within a mile of the lighthouse, patches, with 17 and 18 feet water over them, extend from the Mucking flat nearly half-way across the river. To the northward are the churches of Pitsey, Fobbing, and Corringham; and to the westward those of Stanford-le-Hope, Mucking, and East Tilbury.

Pitsey church, which stands farthest to the north-east, has a shingled spire, standing in the middle of a round clump of trees; Corringham has a low spire; Standford-le-Hope has a tower on its north side; and East Tilbury a white spire on a tower steeple, standing near the upper part of the reach at Hope point and Coalhouse fort. On the eastern side of the river is the conspicuous church of Cliffe, with a chalk-pit to the westward of it.

At the junction of Lower Hope and Gravesend reaches three powerful batteries are constructed, viz., Coalhouse fort near East Tilbury, and Cliffe creek and Shorne Mead batteries at the shore edge of Higham marsh.

Buoy.—A large black can buoy in 18 feet marks the eastern part of the Ovens flat, that extends from Coalhouse point. It lies with Gravesend and Denton mill in line bearing W. ½ S.; the westernmost magazine in line with the chancel end of East Tilbury church, N. by W.; and Mucking lighthouse N.E. ¼ E.

Measured Mile.—For the purpose of ascertaining the speed of steam vessels, the length of a nautical mile is marked on the eastern shore of Hope reach. The north-east marks are two beacons in a line erected on Lower Hope point; and the south-west marks are two beacons in line, at the north-east point of Cliffe creek, near the coastguard station.

DIRECTIONS.—A vessel from Sea reach having arrived at a convenient distance abreast the West Blyth buoy, should steer about W. by S., which will carry her to the fairway in Lower Hope reach. When Mucking lighthouse bears about N.E. ¼ E., keep it in that direction, and steer S.W. ¼ W., which will lead to the black buoy on the Ovens flat; or pass in mid-channel down the reach, rather towards the eastern shore. Denton mill well open to the right of Gravesend windmill W. ¾ S. will clear the flat ground extending south-eastward of Coalhouse point, and lead to the fairway in Gravesend reach. On the eastern shore of Lower Hope reach the flood tide is slack; and close to the shore no tide sets at all. On the western shore opposite Lower Hope point the ebb tide is slack, but to the eastward of Mucking lighthouse it sets strong to the eastward towards Shell haven.*

AT NIGHT.—Having arrived at the narrow stripe of *red* light, that is shown from the Mucking lighthouse in the direction of the West Blyth buoy, at a distance of 3 or 4 cables from the light, a W. by S. course will carry a vessel to the fairway in Lower Hope reach. When Mucking light shows *red*, steer about S.W. ¼ W., taking care to keep to the southward, so as to open the white light in approaching Coalhouse point to avoid the Ovens flat extending from that point.

GRAVESEND REACH is 3½ miles in length in an E.S.E. and W.N.W. direction, and between the town and Tilbury fort on the north shore, the navigable part of the river is about 3½ cables in breadth. It is bounded on the Essex or north side, between Coalhouse point and Tilburyness, by the Tilbury and Chadwell marshes; and on the Kentish or south side by the Higham marshes, Gravesend, and the shore of Northfleet. Here all vessels arriving from abroad are visited by the health officer, receive on board the revenue officers, and change pilots. There are eight sets of moorings, capable of holding the largest ships, off Gravesend, with mooring buoys attached to them; they are mostly used by large ships and transports on their outward voyages.

Vessels anchoring at Gravesend should keep on the south side of the reach with the *red* light at Northfleet in sight; but if under way, on the north side in the navigable channel, with the white light visible.

GRAVESEND, on the right bank of the Thames, is built on the declivity of a hill sloping down to the river. It occupies a pleasant and healthy situation, and from the heights above the town, especially that called Windmill hill, extended views of the river with its windings and shipping are obtained. The easy access by steamers and railways to this place renders it the resort of a constant succession of visitors from London, to which it is chiefly indebted for its prosperity, and which has been the cause of its gradual increase in size and importance. There are two commodious piers; that belonging to the town is 160 feet long, consisting of piles of cast-iron, supporting a floor, extending outwards nearly 50 feet beyond low water mark, with a bell, clock, and lantern on shore, supported by ornamental columns. At 1½ cables eastward is the Royal terrace pier and gardens.

The Gravesend chalk and flint are extensively worked in the vicinity. Rope-making and ship-building are carried on to some extent, and numerous smacks and small craft belonging to the port are employed in the herring, shrimp, turbot, and cod fisheries; and a large part of the trade of the place arises from the intercourse with the numerous outward-bound vessels which stop here; there is every facility for the supply of coals to shipping from floating depôts.

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* *See* Admiralty plan of Gravesend reach, No. 2,151, scale, $m = 5 \cdot 0$ inches; River Thames, Gravesend, to the Nore, No. 2,450, scale, $m = 2 \cdot 0$ inches; and London to Gravesend, No. 2,484, scale, $m = 4 \cdot 0$ inches.

Gravesend is 23½ miles from London bridge by the North Kent railway. There is a steam ferry to the opposite shore, which connects Gravesend to the London, Tilbury, and Southend railway. The gardens around Gravesend are rich and fertile; they not only supply the numerous shipping which stop here with all kinds of vegetables, but furnish some to the London market. An excellent supply of meat, poultry, &c. is to be found. The population of Gravesend in 1871 was 21,183.

Tilbury Fort, opposite Gravesend, forms one of the main defences for the entrance to the Thames. It has very large bastions, and on its ramparts are mounted batteries of heavy ordnance. It is encompassed by a deep wide fosse, and the garrison have the power to lay the whole of the surrounding level under water. The block house was first erected by King Henry VIII. in 1539. The width of the Thames here at high water is 850 yards.

LIGHTS.—At Northfleet, 1½ miles above Gravesend, and abreast of Tilbury ness, a *fixed* light is exhibited from a skeleton beacon 53 feet high, erected upon the India Arms wharf, and when bearing W.N.W. is in line with the high chimney of the cement works. From Gravesend reach the light shows white to the northward of this line, and *red* to the southward over the anchorage ground. Also, white through Northfleet Hope eastward of a S. by E. bearing, which line passes over Broadness flat in 9 feet at low water; and *red* westward of that line.

NORTHFLEET HOPE extends from the western part of Gravesend reach nearly north for 1¼ miles to Broadness, a low marshy point. The marshes on the west side of the reach are low, and sometimes overflowed by the tide to the distance of half a mile. Along both sides of the reach the shore is more or less bordered by flats, and at Broadness it stretches more than 1½ cables to the north-eastward. On the Essex shore, in the bend of the river northward of Broadness, the Tom of Mucking and Black shelf extend off nearly 1½ cables. The village of Northfleet with its church is on the Kentish shore at the southern part of the reach. At about half a mile to the north-west of it, on an eminence, is Huggins college, a charitable institution for 40 decayed tradesmen, consisting of a range of buildings with a lofty slender spire rising from its chapel. Here is a private ship-building yard belonging to Mr. Pitcher, with a graving dock 400 feet long, and having 19½ feet over the sill, excavated out of the chalk. Just below are the Rosherville gardens, with a small pier at which steamers call.

Grays Thurrock is on the Essex shore at the northern part of the reach, having a church with a square tower.* Between Broadness and the Black shelf, vessels should keep in the tideway, and in turning up with the flood not stand into the eddy. The tide, both ebb and flood, sets strong towards the Black shelf, and the ebb towards the shore at North fleet. Vessels whilst in the fairway of Northfleet Hope will have the white light open. The *red* light should not be opened until to the northward of Broadness.

Training Ship.—Off Grays is moored the *Exmouth* training ship for boys, to fit them for the Royal or Mercantile Marine.

Beacons.—An iron beacon, painted black, surmounted by a globe, stands on Broadness, which marks the position of the marsh when overflowed. On the Essex shore, about a cable south from St. Clement's church, are two beacons, which in line, bearing W. by N. ½ N., clears the Black shelf in 30 feet water.

ST. CLEMENT or FIDLER REACH, in an E.N.E. and W.S.W. direction, and about 1¼ miles in extent, is that part of the river bounded between the village of West Thurrock and Stoneness on the north, and Broadness to Greenhithe on the south shore; hence the Thames turns at a right angle to the north-westward. The church of West Thurrock has a square tower, and is dedicated to St. Clement, whence the reach takes its name, and with the windmill form conspicuous objects on the shore; the peculiar agitation of the water in the lower part of the reach, caused by the contracted space in which the stream with its eddying tide runs during the flood, may have given rise to the second name. To the north-east is Belmont castle, a handsome castellated building on the rising land. The flats extend a little off each side of the reach, and about a third of a mile westward of Broadness beacon there are 9 feet water at a cable from the shore. Swanscombe marsh forms the east side of the reach, the northern part of which is low, and sometimes overflowed by the tide to the distance of half a mile.

LONG REACH, between Greenhithe and Crayfordness, extends S.E. by S. and N.W. by N., and is 3 miles in length; and at the narrowest part between the low water shores is 3 cables wide. It is bounded on the north-east by the West Thurrock marshes, and on the south-west by Stone and Dartford marshes. The town of Greenhithe stands on the Kentish shore in the bend of the river at the south-east end of the reach.

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* A pier extends out from the shore south of the village to beyond the low-water mark.

It has long been noted for its export of chalk and lime; in the former, petrified shells and many other extraneous fossils have been found. Ingress abbey, partly built from the stone of old London bridge, and park is close to the eastward of it. To the south-east is seen the dark spire of Swanscombe church; and on the west is the village and church of Stone. The latter is a fine gothic structure, with a square tower, surrounded by orchard trees. In the valley beyond is Stone castle.*

The low marshy point on the north side of the river opposite Greenhithe is called Stoneness, at the extremity of which is a white beacon with a diamond head; from it is a ferry to the opposite side. At the upper end of Long reach, at about a quarter of a mile south-east from Crayfordness, just above the Long reach tavern, is Dartford creek, and on the opposite side of the river is the village of Purfleet. Here the Government have extensive bomb-proof powder magazines. On the rising land called Beacon hill is a flagstaff and a small circular lighthouse used by the Trinity Board for experiments. From Dartford creek the water shoals off a considerable distance, and at 1¾ cables from the shore there are 16 feet.

Vessels steering up the reach should keep in mid-channel and rather towards the northern shore in approaching Purfleet, until the eastern part of Erith is open, then round Crayfordness at a distance of 1½ cables, and steer for the northern shore.

Anchorage.—Above Greenhithe, in the bay opposite the village of Stone, there is good anchorage for the largest vessels in 30 feet water; and in any part of Long reach bay large ships may anchor.

Training ships.—Off Greenhithe are moored the *Chichester* and the *Arethusa* Industrial school and Training ships for boys, and the *Worcester* for educating young officers. Off Purfleet, the *Cornwall* for educating boys from reformatories.

Measured Mile.—On Dartford marshes the length of a nautical mile is measured for steam vessels to ascertain their speed by.

ERITH RANDS, extending 1½ miles E. by S. and W. by N., is the reach in that part of the river between Purfleet and Erith, having Aveley and Wennington marshes on the north, and Crayford marsh on the south. In the middle of the river, at the western part of the reach, is the remaining part of a shoal called the Rands Hill. It is about 2¾ cables in length and nearly a cable in breadth, having from 14 to 17 feet over it at low water. Its west end is S. ½ W., distant 2 cables from Cold Harbour point. Between the Rands Hill and Crayfordness as little as

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* In the deep bend of this reach, near Greenhithe, warping buoys are laid down for swinging ships to determine the local deviation of the compass. A good distant mark is Severndroog tower on Shooter's hill.

13 feet at low water may be found, and the same depth westward of the shoal between it and Erith. In the channel northward of the shoal the least depth is 19 feet.

Close to the river bank, south-eastward of Erith church, is a beacon with a white diamond top. This beacon kept in line with Belvedere tower bearing W.N.W. leads through the channel north of Rands Hill shoal.

When Cold Harbour point bears N. by E. and the eastern shore of Erith reach is well open, steer to the northward in mid-channel or rather towards the western side of Erith reach, Steering northward of the Rands Hill, from about 1¼ cables northward of Crayfordness or about one-third across the river, edge towards and keep along the northern shore. When nearly abreast of Cold Harbour point, edge to the southward, give it a berth of at least a cable, and steer for the western shore of Erith reach, hauling gradually up the middle of the reach in the set of the stream.

ERITH REACH lies S. by W. and N. by E., and is about 1¼ miles in length. On its eastern side are the Wennington and Rainham marshes, and on the western side the Erith marsh. At the southern part of the reach, on the coast of Kent, is the town of Erith, with its picturesque church having a spire. To the westward of it is Belvedere park, beautifully wooded, with a square tower and staff, now called the Royal Alfred Asylum, and established in 1867 for the reception of destitute aged merchant seamen. There are two magazines on this side close to the river bank.

On the opposite side of the river is Cold Harbour point, on which are some farm houses; a bank extends off it for about 3 cables, on which, from one cable off shore, will be found 11 to 17 feet at low water. Rainham creek is formed on the east side in the upper part of the reach ; and at a mile north-east from its entrance is the village and church of Rainham; the tower of the latter has a short white spire. On the opposite or west side of the river is Jenningtree point and magazine, a bank extending off the shore. Vessels proceeding through Erith reach should keep mid-channel, giving Cold Harbour point a wide berth in entering. The least water at 1½ cables off is 14 feet.*

HALFWAY REACH extends from Jenningtree point on the Kentish shore, in a north-west direction for about 1½ miles, to Leather Bottle point or Crossness, and is bounded by the Erith marsh, and on the north or Essex shore by Hornchurch and Dagenham marshes. Above Jenningtree point are two magazines. A little eastward of Leather Bottle point is a public-house known as the Leather Bottle, which is midway between London Bridge and Gravesend; and a little farther to the eastward are the Metropolitan main drainage works. On the north shore, at rather more than half a mile eastward of Leather Bottle point, is a place called Old Breach, formed in the embankment of Dagenham marsh by a high tide in December 1707. Dagenham pool within, is the site of a proposed dock. At 2½ cables N.E. ½ E. from the magazine next west of Jenningtree point, and 1¼ cables from the northern shore, is a narrow sandy bank, rather more than a cable in length, having 10 to 13 feet on it at low water.

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* The banks which formerly extended to the north-west from this point have been removed, and the water deepened in many other parts of the river, by the Thames Conservancy, and dredging is still in operation.

The river on the north side near the Old Breach has been deepened and the shoals removed. On the south side of the reach are the outfall sewers of the main drainage of the Metropolis, the contents of which are let into the river every high water, and large banks of mud are deposited from them in the river bed, forming shoals of 8 and 9 feet at low water.

Vessels of large draught having rounded Jenningtree point in mid-channel should keep along the northern shore at a distance of about 1¼ cables. The common anchorage in Halfway reach is on the north side, with Cold Harbour point just shut in with that of Jenningtree; here there will be 19 and 20 feet at low water.

BARKING or TRIPCOCK REACH, East and West, with a small curve to the southward, is 1½ miles in extent, between Leather Bottle point and Margaretness on the south shore. At the western part of the reach on north side is Barking creek, with magazines and chemical works at the eastern side of the entrance.

Barking church has a square tower, and is about 1¾ miles from the river. On the south side of the reach are the Plumstead marshes, and beyond them on the rising land the old red brick church of Plumstead. About a third of a mile from the house near Leather Bottle point are two red roofed houses, with a powder magazine and a jetty.

About an eighth of a mile westward of Barking creek is the northern outfall of the London main drainage.*

From Leather Bottle point a bank extends off called Leather Bottle shelf, and at the distance of rather more than a cable there are only 9 and 10 feet at low water. At about three cables eastward of Margaretness are some trees, and a Government powder magazine with a jetty. A flat in front of it extends a little off having 9 feet on its edge a cable from the jetty. In the channel northward of Leather Bottle shelf the depths are from 15 to 25 feet. Barking or False point is about a third of a mile eastward of the entrance to Barking creek: the shore from thence eastward curves a little to the northward, and is bordered by a flat, which, opposite Leather Bottle point, extends off about a cable.

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* A large deposit of sewage has taken place close inshore, but not so as to materially affect the navigation of the river—1876. By the Thames Navigation Act, 1870, the Metropolitan Board of Works are bound to free the banks from obstructions arising from the flow of sewage.

About a cable off Barking or False point an irregular bank called the Moorlogs, stretches in the direction of the river for more than a cable with 5 to 10 feet water over it, leaving a narrow passage between it and the south shore having from 14 to 23 feet water. The apex of the jetty at the powder magazine near Leather Bottle point, on with the southernmost of the two red roofed houses, lead in the deepest water southward of the bank.

GALLION REACH, between East Ham level on the west, and Plumstead marshes on the east, lies N.E. and S.W., and is about a mile in length. About half way along the northern side, a short distance south from Duval's house, is also the new eastern entrance and canal to the Victoria docks.* On the western part of the southern shore are the extensive works of the Woolwich arsenal. The western shore is bordered by a shelf, which at low water is uncovered some distance, and the 12 feet line of soundings runs along from 1½ to a cable from the shore; the deepest water being on the south-east side of the reach. A shelf also extends a little off from the east shore, between Margaretness and Ware point. In the middle of the reach the depths are from 17 to 25 feet. On the eastern side above Margaretness are eight sets of moorings, being No. 2 section to accommodate coal vessels.

WOOLWICH REACH lies E.S.E. and W.N.W. between Gallion point and Hookness, a distance of 2 miles, with an average width of a quarter of a mile; the river then runs N. by W. ½ W. nearly a mile, when it trends round Leaness or Blackwall point. The latter part is called Bugsby's reach. The river on the north side is here bounded by the Plaistow and East Ham levels; and the south by the town of Woolwich, the arsenal, the old dockyard, and Greenwich marsh. At nearly half a mile westward of Gallion point on the Essex shore, and nearly opposite the west end of the arsenal, is the terminus of the North Woolwich railway, with a low-water pier, and steam ferry across to Roff's pier; about 4 cables westward of it is Ham creek. The shore from Gallion point is bordered by a flat, which extends off from a quarter to nearly three quarters of a cable to Ham creek.

From Ham creek to Hookness the edge of the flat is nearly a cable from the shore, with 5 and 6 feet on it; and all along the north part of this reach the water is shallow to a distance of a quarter of a mile from the shore. The shoal formerly known as Ham shelf has been entirely removed by the Thames Conservancy dredger, and where there were only 4 or 5 feet water there are now depths of 13 and 14 feet. Abreast the town of Woolwich the shore is bordered by a flat at a distance of about half a cable. At half a mile westward of what was the dockyard is Charlton ballast wharf, at one cable north-west of which is a patch with only 8 feet water on it. There are other patches with 10 feet on them between the Ballast wharf and Hookness. The deepest water in Woolwich reach, of from 12 to 18 feet, is along the southern shore until approaching Charlton ballast wharf. The general depth through the reach is about 11 feet at low water springs.*

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* In progress, 1877; *see* page 18.

In Bugsby's reach the shore is bordered on either side by narrow flats. Hook shelf extends about a cable's length from Hookness, with 8 feet on its edge. Off the Trinity wharf, at the entrance to Bow creek, in the upper part of the reach, there is a flat from the shore having 8 feet on its edge. On the south and west sides of Woolwich and Bugsby reaches from Charlton pier to opposite the Victoria docks are sets of moorings with buoys, being No. 1 collier section, at which coal vessels are made fast whilst waiting their turn to enter the pool to unload, or until their cargoes are sold.

The river Lea divides Middlesex from Essex, and falls into the Thames opposite Leaness or Blackwall point. At the west side of the entrance, commonly called Bow creek, is the Buoy wharf of the Trinity House, where, is an admirable establishment for the fitting and repairs of light-vessels and buoys belonging to the Corporation.

Docks.—On the opposite side of Bow creek, in the Plaistow marshes, are the Victoria docks, which occupy a space of 74 acres. The entrance lock, a little below Bow creek, is 300 feet long and 80 wide. The dock has a depth of 23½ feet of water. There is a half-tide basin of 16 acres, and warehouse floor of about 11 acres. There is also a hydraulic lift dock capable of lifting a ship of 2,000 tons and 300 feet in length on a pontoon for repairs. The docks were opened in 1855.

Works were commenced in February 1876, for the extension of Victoria docks, which will occupy a period of over three years. The new work for Victoria docks, including a basin 20 acres in area, will extend a distance of 2 miles between Blackwall and Barking. The entrance to the new docks is near Barking.

Woolwich Town extends for 2 miles along the south bank of the Thames, and gradually rises up the brow of the hill for half a mile to a spacious level of 250 acres, named Woolwich Common. Here, at a height of 150 feet above the river, are the head-quarters and barracks of the Royal Artillery, having accommodation for about 4,000 men; with a garrison chapel, library, hospital, and an academy for cadets. Just above, to the south-east, Shooter's hill attains a height of 446 feet. In the upper part of the town are barracks for 1,200 men, and an infirmary well placed on the slope of the hill, with beds for 270 patients.

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* The water in the reach is to be deepened to 16 feet.

Woolwich joins with Deptford and Greenwich under the name of the borough of Greenwich. The whole population in 1871 was 167,632.

The Dockyard, the formation of which dates from the time of Henry VIII., but as a dockyard establishment was discontinued in 1869, is now in the hands of the War Department; it contains an area of 56 acres. It has an outer and inner basin; the former occupying an area of more than 3 acres, with 22 ft. 10 in. over the sill at high-water springs;* the latter with an area of more than 2½ acres, and 21 feet over the sill at high-water springs. Here were six building slips, and three graving docks, one of 290 feet long and 21 feet over the sill; also a large steam factory and every requisite for building ships and the repair of steam vessels.

The Royal Arsenal adjoins the town of Woolwich on the east It occupies an area of 274 acres, and comprises within its walls a gun factory, a carriage department, and a laboratory with all the most recent improvements. It contains also vast stores of cannon, shot, and shell for the armament of our forts and ships of war. The works usually employ 4,000 men. The arsenal was first established in 1716. To the eastward, in the Plumstead marshes, is an extensive piece of ground reserved as a practice range.

BLACKWALL REACH from the East India docks at Blackwall, curves to the south-west and southward to the town of Greenwich, a distance of about 1½ miles. The shore on each side continues low. The isle of Dogs bounds the reach on the west, and Bugsby and Greenwich marshes on the east. Leaness, or Blackwall point, the north extreme of Bugsby marsh, is low, and bordered by a flat that extends off about half a cable's length. Near the entrance of the West India docks on the east side is the Gun shoal, with 8 and 10 feet on it at low water. Its outer end has been removed; the remainder of the shoal stretches to the northward from the entrance to the South dock, and its extremity is about one-sixth across the river; there is a general depth of 14 feet at low-water springs in the reach.

The East India docks at Blackwall are westward of Bow creek, and include an import basin of 18 acres, an export basin of about 9, and an entrance basin of 2¾. The depth of water in the dock is 23 feet. The breadth of the entrance gate is 48 feet. These docks were opened in 1806. In front of the docks is a wharf called Brunswick wharf, 750 feet in length, with 11 feet water close to it. Here is the terminus of the Blackwall railway, by means of which communication is made with the city and other places. The wharf forms a terrace, commanding extensive views of the river and surrounding scenery.

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* For the daily corrections to be applied to determine the depth of high water over the sills of the different docks in the Thames, *see* Admiralty Tide tables, page 100.

The West India docks extend across the base of the peninsula of the isle of Dogs ; they comprise an import and an export dock, communicating with the river at Blackwall and Limehouse, and a basin of 19 acres for storing-timber. The export dock occupies about 25 and the import dock 30 acres. The gates are 45 feet wide, and at the highest spring tides the depth of water is 24 feet. The import and export docks are parallel to each other, but divided by stacks of warehouses. There are sheds for sheltering the goods, and the chief warehouses are capable of storing 170,000 hogsheads of sugar, besides other articles. The space occupied by the docks and warehouses is 295 acres. These docks were opened in 1802. The City canal is now used as a timber dock. At East Greenwich opposite Blackwall pier is a dry dock, the length of which is 400 feet; width of entrance 60 feet; and average depth of water at spring tides 21 feet; it is called the Blackwall point dry dock.

Drill Ship.—In the City canal is moored the *President*, drill ship for the Royal Naval Reserve.

GREENWICH REACH forms a semicircle, with its extremes to the northward, and is about a mile in extent, and between the walled shores about 1¾ cables across. The north shore is flat, and is formed by the marsh called the isle of Dogs, having its river frontage now covered with steam factories and iron ship building yards, at one of which the *Great Eastern* was built and launched broadside into the river. On the south side of the reach is the town of Greenwich with its hospital, churches, park, and observatory. Charles the Second's palace, now used as a Royal Naval College for the education of officers, consists of four detached piles of buildings forming a square open towards the river. A noble terrace 290 yards long, with a central flight of steps leading to the water extends in front. The palace was begun in 1675, but it was not until after the naval engagement of La Hogue, 1692, that it was devoted by the queen as a hospital for aged and wounded seamen, and completed by the king after her death ; "yet few of those who now gaze on what was the noblest of European hospitals are aware that it is a memorial of the virtues of the good Queen Mary, of the love and sorrow of William, and of the great victory of La Hogue."*

In the rear of the building is an infirmary and a school for 1,000 boys, the children of seamen.

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* The infirmary of the college has been given for the reception of the sick hitherto received on board the *Dreadnought*, so long in use as a Hospital ship for all nations (1869).

The Royal Observatory stands nobly on the most elevated land in Greenwich park, rising up gradually in the rear of the hospital to a height of 154 feet above the mean level of the river. It was founded in the reign of Charles II. for the advancement of navigation and nautical astronomy, and its directors have been Flamsteed, Halley, Bradley, Maskelyne, and the present Astronomer Royal, Airy. Here is the great primary meridian, from which, east and west, the longitude of the greater part of the globe is measured. Here, too, is a chronometer room, to which the first makers in Great Britain send their choicest watches to have them examined and tested. Besides the Greenwich "Tables of the Moon," which have a world-wide reputation, a course of magnetic and meteorological observations is pursued here of the highest interest and importance.

Time ball.—A ball is dropped every day from the top of a pole on the eastern turret of the Royal observatory, Greenwich, at the moment of 1 p.m. mean time. The ball is hoisted half up the pole at 12h. 55m., as a preparatory signal, and close up at 12h. 58m. By observing the first instant of its downward movement, all vessels in the adjacent reaches of the river, as well as in most docks, have an opportunity of finding the error of their chronometers. The electric telegraph wire also causes a ball to drop at the same instant at Deal so that outward bound ships may determine the error and rate of their chronometers. Also at the Royal Exchange, and at Charing Cross. The Post-office in London also receives the time signals, and through it the time is transmitted to several places where a gun is fired or a ball dropped at 1 p.m.

Deptford town and Dockyard are separated from Greenwich by the Ravensbourne, here called Deptford creek. The dockyard, established in the reign of Henry VIII., was sold in 1869, and has become the property of the London Corporation, as a foreign cattle market. It covers an area of 31 acres, and had three small floating basins of about eight acres, two graving docks, and eight building slips. The adjacent victualling yard, with the old dockyard, has a river frontage of 900 yards, the former having several hydraulic cranes along the wharves, and all the requisites for the rapid supply of a large quantity of provisions. The establishment employs 400 men, and covers about 41 acres. The depth in the reach abreast the dockyard is from 14 to 20 feet at low water, with an 18 feet rise of tide.

LIMEHOUSE REACH, above Deptford, runs to the northward for about three quarters of a mile, when it trends to the westward round Rotherhithe. Its eastern shore is formed by the Isle of Dogs, where there are manufactories of iron ships, cement, oil, chain-cables, &c. The entrance to the Millwall docks, which are in the centre of the island, is also on this shore. Millwall docks are capable of containing the largest vessels, and have graving docks for the repairs of the same. Several windmills formerly stood here, hence its present name Millwall. That part of the reach between the western entrance of the West India and Limehouse docks is called Limehouse hole, and is frequently crowded by foreign vessels. Along this part of the banks of the river are several merchant dockyards, and a steam-boat pier, at which all the Woolwich steam vessels call; there is also a pier near the Commercial docks on the western shore. The Regent's canal from Paddington opens into Limehouse dock. It is 9 miles long, and has 12 large locks.

The Commercial docks extend along the shore of Rotherhithe on the right bank of the river, opposite Limehouse and Millwall. They inclose about 120 acres, of which 70 are water, and were designed to receive vessels laden with timber, corn, &c. They are divided into six unequal parts. Parallel to them is the Grand Surrey canal, having an inner and outer dock at its entrance. The shore on both sides of the reach continues to be bordered by narrow flats. On the western shore, opposite the West India docks, the flat extends off three-quarters of a cable. The whole breadth of the reach from the Commercial dock pier across to the Isle of Dogs is shallow; the ground being known by the name of the Whiting shoal, which is a compound of conglomerate of shells, lime, and gravel; over which is a general depth of 9 to 11 feet, but a channel in mid-river of 13 feet deep and 100 feet in breadth has been dredged.

The Lower Pool, from the entrance to Regent's canal or Limehouse dock, extends W. by S. nine-tenths of a mile. A little westward of the entrance to Regent's canal are the East India warehouses, and the entrance to the London docks; and at one-third of a mile farther on is the Thames tunnel, which communicates between Middlesex and Surrey. Its entrance is a little north-east or below Rotherhithe church, and its direction towards King Edward stairs on the Wapping shore. It was completed in 1843, and is now traversed by a railway in connexion with the Brighton and South Coast Line. At Wapping new stairs, the first stairs below Wappingness, is the Thames police office.

The steeple of St. Anne, at Limehouse, may be seen throughout the reach, and on the right bank the steeple of St. Mary, with its useful clock, is conspicuous. The London docks, situate between Ratcliff highway and the Thames, consist of two docks; the western covering 20 acres, and the eastern about 7 acres. The latter has its entrance at Shadwell, and the former near Wapping old stairs, and also at the Hermitage entrance, 2 cables farther up the river. The entire space enclosed is 71 acres. On each side of the Wapping or central entrance is a dolphin, and a transporting buoy lies nearly in the middle of the river, marking the entrance.*

On the right bank of the pool, about 2 cables southward of the east entrance to the London docks, and about a third of a mile below Rotherhithe church, is the entrance to the Grand Surrey canal. This canal is chiefly used by Canadian timber ships, corn vessels, and light or unemployed shipping. Below the entrance to the canal are various merchant yards and docks. A flat borders the right bank of the pool, and a little above the entrance to the canal it extends off about half a cable. On the left bank from the east entrance to the London docks, the flat curves along shore round Wappingness, and midway its edge is about half a cable from the shore. The colliers here discharge vast quantities of coal, and from this to London bridge the whole scene on the river is that of activity and bustle.

The Upper Pool extends from Wappingness to London bridge, a distance of $1\frac{1}{10}$ miles. The bridge is a noble structure of five arches, and is 970 feet in length from shore to shore. The first stone was laid on the 15th June 1825, and it was formally opened by William IV., on the 1st August 1832. On both sides of the pool are a dense mass of buildings and wharves, bordered by coasting vessels moored in tiers under the direction of the harbour masters. About $1\frac{3}{4}$ cables beyond the Hermitage entrance to the London docks is that of St. Katherine, close to the westward of which is the Tower of London† and beyond it the Custom house. The whole extent of St. Katherine's docks is 24 acres, of which nearly one-half is included in the two docks, communicating by a basin. The entrance lock, near Irongate wharf, is 180 feet long, and 45 feet broad, and admits vessels of 800 tons. The warehouses are large and commodious. This dock was first opened in October 1828.‡ A subway for foot passengers runs beneath the Thames between the west end of the Tower and Tooley street; it was opened in 1870.

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* For the daily corrections to be applied to determine the depth at high water over the sills of the different entrances, *see* Admiralty Tide tables, page 100.

† Small vessels are forbidden to moor within 50 yards, and steamers and large vessels within 90 yards, of the Tower Arsenal wharf, under a penalty.

‡ Owing to the increase of the shipping trade of London rendering more accommodation necessary, the extension of St. Katherine docks was commenced in 1876, which will require 3 years to complete.

THE RIVER MEDWAY—FROM THE NORE TO CHATHAM.

VARIATION, 18° 20′ to 19° 0′ West in 1878.

Decreasing about 9′ annually.

The MEDWAY * rises near East Grinstead in Surrey, flows in a winding direction to the north-eastward across the county of Kent, passing Tunbridge, Maidstone, Rochester, and Chatham. The main stream joins the Thames between the isle of Grain on the west, and that of Sheppey on the east; while an arm called the Swale separates Sheppey from the main land. The Medway has three other principal sources and many tributary rivulets. Below Chatham it widens into a broad estuary, where there are several marshy islands. The river is about 60 miles in length, and is navigable for vessels of about 300 tons to Rochester, and for barges to Tunbridge. The tide flows as far as Gibraltar about 4 miles below Maidstone; here is the first lock of the river.

In the Medway as in the Thames the several bends of the river are termed reaches, of which there are twelve, and will be described in order.

SHEERNESS HARBOUR,† at the mouth of the Medway, extends from Garrison point on the isle of Sheppey to Cockle-shell hard, at the south-east side of the isle of Grain. It lies in a N.E. by E. and S.W. by W. direction, about 1¼ miles in length, and between the point and high-water mark at the isle of Grain three-quarters of a mile in breadth. On the eastern side of the isle of Grain, at 6 cables north-westward of Garrison point, is a conspicuous martello tower; and the shore bordered by an extensive flat, which dries off a considerable distance at low water, and terminates in Grain spit at about 1⅔ miles from the shore.‡

The edge of the flat to the south-west draws towards Cockle-shell hard, where there are generally a large quantity of cockle shells thrown up on the beach. Along this part of the isle of Grain from the martello tower to Cockle-shell hard is called the West Shore. Boats wishing to land on the isle of Grain can only do so about the time of high water, unless at or about Cockle-shell hard. Garrison point is steep-to, and the water is deep along the wharves of the dockyard, but shoals towards the southern part of it. Between the yard and Queenborough point the mud is dry at low water at 3 cables from the shore, which is again bordered by a bank called the Lapwell, which is entirely occupied by moorings for gun and mortar boats.

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* *See* Admiralty plans of the river Medway, sheets 1 and 2, Nos. 1,833, 1,834; scale, $m = 5$ inches.

† *See* Admiralty charts: North Foreland to the Nore, No. 1,607; scale, $m = 1 \cdot 4$ of an inch: Thames river, Sea reach, No. 1,185; scale, $m = 2 \cdot 7$ inches: and Gravesend to the Nore, No. 2,458; scale $m = 2 \cdot 0$ inches.

‡ Two large forts have been erected on the east side of the isle of Grain, one on the shore opposite Garrison point, between the outer and inner black beacons, the other on the higher part of the islet about 1¾ cables south-west of St. James church.

The town of Sheerness is on the north-west part of the isle of Sheppey, at the confluence of the main stream of the Medway with the Thames. It consists of four parts, Sheerness proper, Bluetown, Miletown, and Marinetown; the first contains the dockyard, and, with Bluetown, is encircled by fortifications, beyond which are the suburbs called Miletown and Marinetown. Additional defences have lately been constructed enclosing the whole town, and which are terminated on the coast by the Queenborough and Cheney Rock forts at a distance of 2 miles apart. Sheerness (Sheerness-on-sea) has much improved in recent years, and is resorted to as a sea-bathing place to a considerable extent. The material for the manufacture of copperas is found in abundance on the beach eastward of Sheerness.

The town pier is close to the south end of the dockyard, and projects out nearly 1,500 feet; small steam vessels can lie at the end of it, at all times of the tide, where a small *red* light is shown at night. Between the inner part of the pier and the dockyard, small merchant vessels unload. The population of the isle of Sheppey in 1871 was 17,000.

The Dockyard is built on piles, and the buildings connected with it occupy an area of 57 acres, enclosed by a brick wall. The great basin contains an area of 3½ acres, with 27 feet, at high water springs, over the sill.* There are two other basins of smaller size; three dry docks 251 to 268 feet in length, with 25 ft. 2 in. over the sills at high water springs; two smaller docks; and a building slip. Here is a steam factory, and a self-registering tide-gauge. The dockyard employs about 2,000 men. The town is connected by railway with the London, Chatham, and Dover line at Sittingbourne, having a branch to Queenborough point pier.

The CHANNEL into the Medway is bounded on the south by the extensive flats called the Cant, which borders on the northern shore of isle Sheppey, and in some parts dries off at low water for more than half a mile from high-water mark. The Cant stretches to the eastward from Garrison point, and at the distance of 3 miles its edge, called the Cheney spit, is about 2⅓ miles from the shore, and about three-quarters of a mile southward of the Nore light vessel. On the north side the channel is bounded by the tail of the Nore sand, and a shoal called the Middle ground, lying eastward of the Grain spit, which narrows the deep water channel to about 3 cables. The Middle ground has only 7 feet on it at low water, and between it and Grain spit there are 12 and 14 feet. The tail of the flat eastward of the Middle ground is 3 miles from isle of Grain, and $1\frac{7}{10}$ miles from the shore of Sheppey, with 18 feet close to it. About half a mile more to the eastward is a patch with 18 feet water over it; and at a little more than another half mile in the same direction is a small spot, with 17 feet on it.

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* For the daily corrections to be applied to determine the time of high water over the sills of the different docks *see* Admiralty Tide tables, p. 100.

The Cheney rocks lie about 4 cables off the fort shore, above 1½ miles eastward of Garrison point.

LIGHT.—From the top of the outer or north-western face of the circular fort on Garrison point is exhibited a *fixed red* light, at the height of 50 feet above high water, which should be seen in clear weather from a distance of 5 miles. This light is lost sight of on entering the Medway on a S.S.E. bearing.

Buoys and Beacons.—On the edge of the tail of the flat eastward of the Middle ground, and near its extremity, is Sheerness Middle buoy, a large black spiral buoy with staff and ball in 20 feet; Garrison point bears W. by S. southerly distant 2½ miles; and the Nore light vessel N.E. by E. ¾ E., 8½ cables. Grain spit buoy is black in 9 feet on the extremity of the spit, with Garrison point bearing S.W. ½ W. distance $1\frac{2}{10}$ miles, and the buoy of the Middle ground E. by S. nearly 1½ miles. On Grain islet, about 3 cables West of the martello tower, is a black beacon; a little southward of it is another; and about two cables West of the latter is a white one. Nearly a mile S.W. by W. ⅓ W. from the Grain spit buoy is Grain edge buoy, chequered red and white, and from it Garrison point bears S. by W. ½ W. half a mile; and the martello tower W. by S., the same distance. The Cant edge is marked by a black and white chequered buoy in 21 feet, with black and white beacons in line, West; dockyard church W.S.W.; Minster church S. ¼ E. The Cheney rocks are guarded by a black buoy at their outer edge S.S.W. 8 cables from the Cant buoy. Cockle-shell hard has a white perch with triangle on it.

Torpedo ground.—The ground occupied for torpedo experiments at the Medway river entrance, is on a line from Garrison point, to a point 20 yards within shore of the Cant edge buoy, and at a distance of 1,000 yards from Garrison point.

A buoy marks the position where the experiments will be made.

TIDES.—It is high water, full and change, in Sheerness harbour at 0h. 37m.; springs rise 16 feet, and neaps 13¼ feet. At Chatham at 1h. 11m., springs rise 18 feet, and neaps 14½ feet. The flood stream runs up in mid-channel from 20 to 25 minutes after high water at Sheerness dockyard. The tides are affected by the winds, and with those from the northward there is invariably a greater flow of tide, amounting to 2 and 3 feet above the average. With strong breezes from the S.W. the tide ebbs 2 feet below the average. The standard level at Sheerness is 22 ft. 3 in. below the coping stone of the dockyard wharf; and at Chatham 22 feet below the coping stone of the yard at the landing stairs.

In Sheerness harbour the flood tide sets off from Garrison point towards the middle of the harbour, causing various eddies, and slacks off the dockyard. The ebb runs with great force at the springs, and sets at an angle of about 45° against the west side of isle of Sheppey along the dockyard wharves, causing a rebound and much sea. With strong westerly winds it is almost impossible for boats to communicate with the shore during the ebb tide, and it is not uncommon for boats to be carried out of the harbour. Under these circumstances they should endeavour to pull under the lee outside Garrison point.

DIRECTIONS from the Nore into Sheerness harbour. — The southern tree on Grain islet and outer black beacon in line, and also nearly on with the martello tower, lead along the southern edge of the Middle ground. The white and inner black beacons in line clear the northern edge of the Cant. When about a third of a mile south-eastward of the Nore light vessel, bring the white perch with triangle at Cockle-shell hard in line with Garrison point bearing W. ¾ S., and steer in with these marks, which will lead northward of the 18-feet patch lying eastward of the black buoy of the Middle ground, and the least depth will be 20 feet at low water. When the inner black and the white beacons on the isle of Grain are in line, keep them so, and they will lead to the fairway off Garrison point.

All merchant vessels seeking shelter should anchor above a line drawn from Cockle-shell hard, to the white beacon on the Fleet marsh. A vessel entering the harbour in a leaky state, or having no anchors, should run on the Lapwell mud bank above Sheerness pier.

It is not advisable for those unacquainted with the river to proceed above Sharpness without a pilot.

Anchorage.—The great Nore is a safe anchorage, but, like all places where the tides are strong, it is subject to a sea in bad weather, particularly with easterly winds, to which it is much exposed. A gale from the north-west also causes much sea, in consequence of the long fetch down Sea reach, but with all other winds this is a convenient anchorage. The best berth for a large vessel is with the Nore light vessel bearing about N.W. distant half a mile, Garrison point, W. ¾ S., and Minster church S.S.W. ¾ W., in about 8½ fathoms at low water, soft sandy bottom. The anchorage at the little Nore is with Garrison point bearing S.W. by W. ¾ W., distant a short three-quarters of a mile, and the new church at Miletown in line with the trees on Furze hill, S. ¼ W., in about 8 fathoms. Vessels of war should anchor in Sheerness harbour off the dockyard, in a fairway berth outside the buoys, unless the dockyard authorities direct them to take in moorings. Merchant vessels are not allowed to anchor until above the beacon on the west shore, near Cockle-shell hard as before stated.

The Swatchway, between the Nore sand and Grain spit, is much used by barges and small vessels. The deepest water is close to the westward of the Jenkin buoy, westward of the Nore sand, where there are 5 feet at low water. The black buoy on the Grain spit bears from the Jenkin buoy about S.E. by S. distant above 2 miles. Vessels from the Thames shortly after passing the latter buoy will deepen the water from 5 to 10 feet, and should steer with the grain spit buoy on the starboard bow in from 10 to 20 and 17 feet, passing it at a distance of a quarter of a mile. The deepest water between the Grain spit and the Middle ground is about 3 cables eastward of the black can buoy, where there are 13 feet at low water, when steer for Sheerness harbour.

SALT PAN REACH extends W.N.W. and E.S.E., and is about 2 miles in length. It is bounded on the north by the isle of Grain, and on the south by Fleet and Burntwick marshes. From Cockle-shell hard the flat extends a little off, but terminates at about a quarter of a mile to the westward. A small bank of stones with 3 feet water over them lies nearly three-quarters of a cable from the shore at about 7 cables westward of the white perch. Above the bank of stones as far as Colemouth creek, a distance of 8 cables, the water is deep, and the largest vessels may swing close to the shore. From thence bordering the shore of Stoke marsh is an extensive mud bank called Stoke ooze, which is skirted by a flat called Stoke shelf, and on its edge, at 2½ cables from the shore, are only 12 feet water.

The south side of the reach is bordered by a mud bank, which from Swaleness the west point of entrance to the Swale, extends off upwards of a quarter of a mile and terminates in Queenborough spit, thence this bank fronts the shore to Stangate creek. A small buoy lies off Swaleness, and about half way to Stangate on the saltings is a white beacon, being the southern mark above which all merchant vessels should anchor. From Stangate creek to Sharpness, the western extreme of the reach, the mud bank is bordered by a shelf which extends along shore, and at a third of a mile from the ness stretches off to a distance of a quarter of a mile, with 16 feet water on its edge. This projection is called Sharpness shelf.

Stoke shoal, with only 12 feet over it at low water, and about a cable in extent, lies right in the fairway of the river, about a quarter of a mile north-west of the edge of Sharpness shelf. To clear the Sharpness shelf, keep Queenborough church S.E. ¾ E., until Okehamness is well open of Sharpness W.S.W., then steer for Okehamness to avoid Stoke shoal. The water is deep at and above Sharpness.

Anchorage.—There is good anchorage in any part of Saltpan reach, for vessels of the largest size, eastward of Colemouth creek, but it is not advisable to anchor off the creek, as here the navigable channel is narrow, and if necessary to get underway with the first of the flood there is not so much room as lower down.

The Swale is a small branch of the Medway, separating the isle of Sheppey from the main. It is navigable for small vessels and barges. At Kings ferry, 3 miles from Sheerness, it is crossed by the Sittingbourne and Sheerness railway. The middle of the bridge is fitted with an opening span to enable vessels to pass. The least depth up to the bridge is 8 feet at low water, and at Long point, a little above the town of Queenborough on the isle of Sheppey, the depth is 50 feet. A coast guard vessel lies a little above Queenborough point.

Queenborough point, the East point of entrance to the Swale, opposite Swaleness, is the place of departure and arrival of the Zealand Company's steam vessels, which carry mails and passengers to and from Flushing, in connection with the London, Chatham, and Dover railway, the terminus of which is on the pier at Queenborough point.

LIGHTS.—On Queenborough spit is a pile lighthouse in 6 feet water, from which is exhibited a *fixed* white light at an elevation of 30 feet above high water. The light can be seen from a distance of 5 miles.

From Queenborough pier two *red* lights are exhibited as a leading mark between Queenborough spit and Lapwell bank. The lights are visible through an arc of 45 degrees, and in clear weather can be seen from a distance of 3 miles.

Buoy.—A beacon buoy has been placed on Lapwell bank, at the entrance to Swale channel; for the better navigation, and to prevent vessels from anchoring in the fair-way of that channel.

The buoy is moored in 14 feet low water spring tides, with Queenborough spit beacon bearing S.W. ½ W. distant 200 yards; with the following notice painted on it in black letters on a white surface, viz.:—*All vessels to anchor eastward of this buoy.*

STANGATE CREEK (Quarantine Ground), a small arm of the Medway bounded on either side by low marsh land, is the well known [illegible] [illegible] and [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] establishment. It runs to the southward [illegible] about [illegible] miles, varying from 40 to 21 feet at low water, [illegible] a [illegible] of no different directions. About half a mile within the entrance on the west side is a creek leading into some oyster grounds and through to Hoo creek, having depths of from 7 to [illegible] feet.

TIDES.—The flood [illegible] [illegible] from Sheerness [illegible] towards the mooring [illegible] at [illegible], and from thence straight up Saltpan reach. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. The [illegible] sets from Kitshole reach towards the [illegible] [illegible] [illegible] and along the line of mooring buoys on that shore, passing a [illegible] on the south shore above [illegible] creek. There is also a [illegible] [illegible] on the [illegible] [illegible] by the isle of Grain.

KITSHOLE REACH, extending to the south-westward from Saltpan reach, is about a mile in length, and bounded on the north-west by the Stoke and Okeham marshes, and on the south-east by [illegible] marsh. At the south end of the reach is [illegible] creek, from which branch off the [illegible], Lower [illegible], and [illegible] creeks. [illegible] is the north-east extreme of the reach, and Okehamness and the spit of Bishops ooze the southern extremes. On the west shore is the continuation of the extensive mud flat called Stoke ooze, with two openings, named Stoke and East Hoo creeks.

Off Okehamness, the north point of entrance to Long reach, is a black buoy which grounds on the mud at low water. On the east shore, near the mooring buoy, is a beacon which marks the entrance to [illegible] creek, leading into [illegible] oyster grounds, which is much used by the fishermen during the oyster season; there is also another beacon south of the last, called [illegible] beacon, on the edge of the marsh at the south entrance of Hoo creek. The line of tide is always so plainly defined that it is only necessary for vessels to keep in the stream of it, and when working, tack before getting into the eddy. In standing towards Stoke and Hoo creeks, tack when in 6 fathoms water. The lead should be attended to.

Anchorage.—It is customary for vessels of large draught to anchor in Kitshole reach to wait for the tide. If bound up, anchor on the western shore; but if going down, on the eastern shore. In both cases the tide sets off: vessels will thus be out of the track of those under way.

LONG REACH extends nearly W.N.W. and E.S.E. about 1¾ miles. It is bounded on the north, between Okehamness and West Hoo creek, by the Stoke ooze; and on the south by Bishops marsh, which is bordered on the north side by a mud bank, and an extensive mud flat running eastward from it named Bishops ooze.

On the north side of the channel is an extensive shoal called the Mussel bank, a part of which, a little eastward of Tea-pot hall, on the north shore, dries at low springs. The navigable channel is thus reduced at low water to about a cable in breadth, having a depth of 12 feet; but on the south side of the reach along by Bishops marsh is a narrow lane of deep water carrying at least 20 feet, leading into Pinup or Folly reach. The south edge of the Mussel bank is marked by two red buoys.

Anchorage.—In the lower part of this reach, off Bishopsness, is a good berth; and also in the upper part, called Darnett hole, in 5 fathoms water.

DIRECTIONS.—From Kitshole reach steer westward towards Gillingham church (which is conspicuous, and stands on rising ground surrounded by trees), and when Frindsbury mill (a little north of Strood) is nearly on with the north side of Bishops marsh steer about W.N.W. The leading mark through the reach is Frindsbury mill on with the south end of the houses at Upnor. Frindsbury mill on with the north end of Folly marsh, forming the south side of West Hoo creek, clears the Mussel bank. A small red-roofed house in the sheepfold on Folly marshes, in line with the tall elm trees close to the southward of Frindsbury church, lead to the southward of it.

PINUP or Folly Reach extends a distance of half a mile to the south-westward from Darnettness, the north-west part of Bishops marsh, on the east, to Folly point on the west, off which, a little within the high water, is a beacon. On the eastern shore is Bishops marsh, and on the west is Hoo flat or Folly marshes, bordered by an extensive mud flat.

A large circular fort, called Darnett, has been erected on the ness, and a similar one on Folly point, called Hoo fort.

In the upper part of the reach is a dangerous shoal, called Pinup bank, with only seven feet on it at low water, which here contracts the channel to less than a cable in breadth. The south end lies with Hooness or Catness, the north-west point of Gillingham reach, just open of Folly point, or Frindsbury mill just over the point. Two red buoys mark its south and eastern edges. The deep water channel is to the southward of this bank; but there is a very good channel, carrying 8 feet at low water, northward of it. The leading mark through is the white beacon, on the east side of Muddle creek, on with Star mill, standing on the distant hill.

Vessels after rounding Darnettness should steer about S.W. ½ S. for Friday mill or a little eastward of it. When Tea-pot hall is a little open of Darnettness steer on that line until Fridsbury mill is well open of

Hooness, then steer to the north-westward for the fairway in Gillingham reach.

TIDES.—The flood tide sets off Darnettness towards Folly point causing a slack tide to the south of the ness. The ebb sets from Gillingham reach into Yantlet creek.

South Yantlet Creek is an arm of the river running somewhat parallel to Long reach and southward of it. It is formed by the isle called Bishops marsh and the extensive mud flat named Bishops ooze extending eastward of it. This creek runs from Pinup reach to that of Kitshole, and carries from 6 to 18 feet at low water.

GILLINGHAM REACH extends from Folly point in a W.N.W. direction, and is about a mile in length. The north shore is bordered by a mud bank which extends off about three quarters of a cable. Along the south shore the mud dries off some distance, and on it are several small islets. A shoal called the Mussel, stretching from the south shore, contracts the channel to less than a cable in breadth. A vessel after rounding Pinup bank should steer towards Hooness. The village of Upnor in line with Hooness leads clear of the north-east part of the Mussel bank. When Gillingham church is in line with a small red-roofed house in an orchard, a vessel will be at the upper end of the bank, and may steer more to the southward.

Nearly in mid-channel southward of Hooness is a shoal about half a cable in length, having 12 feet over it at low water. Between it and Hooness there are 14 feet water, but the deepest channel is to the southward of the shoal. There is a good space for anchoring between the lower moorings off Gillingham and Hooness, in 17 feet water; or westward of Hooness with Folly point open, in 25 feet. Off Folly point beacon westward of the Pinup bank the depths are 24 to 28 feet.*

TIDES.—The flood tide sets from Folly point towards the south shore above Muddle creek, and then branches off. The ebb sets from short reach towards the moorings and Commodore's hard, then down the reach into South Yantlet creek and Pinup reach.

SHORT or SOVEREIGN REACH, between Hooness and St. Mary's marsh, is about half a mile in length. It is bordered by a shelving sandy flat on each side, leaving in mid-channel a narrow passage having from 12 to 19 feet at low water. A vessel having rounded Hooness and arrived at about a third of a mile above the former entrance to

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* Since the closing of St. Mary creek, the action of the tide is washing away the bank at Hooness (Catness).— Staff Captain, J. Loane, Master Attendant, H.M. Dockyard, Chatham, 1876.

St. Mary's creek, now the Fitting basin, Muddle creek white beacon on with Hooness leads through the fairway to Cockham wood reach, between the spit of St. Mary's marsh and the north part of Hoo flats, in not less than 11½ feet at low water.

COCKHAM WOOD REACH is that part of the Medway between the north-eastermost point of St. Mary's marsh and the London stone at Lower Upnor. It runs in a N.W. by W. direction, and is about three quarters of a mile in length. On the north shore are the ruins of an old fort at Cockham wood. St. Mary's marsh, the river front of which is faced with stone, is bordered by a shelf which extends a little off, having 7 feet water on it. At the north extreme of the marsh and opposite the Crow or London stone, the edge of the shelf is about half a cable from the shore. In mid-channel is a small bank with only 10 feet water on it. Midway between it and the shore the channel is 14 feet deep.

UPNOR REACH extends from the London stone at Lower Upnor in about a S.W. by S. direction, and is about three quarters of a mile in length. Upnor castle stands on the western shore, and a little below it is the powder magazine, off which vessels are not allowed to anchor. The depths in this reach are from 12 to 17 feet at low water. St. Mary's creek was formed by the marsh of the same name on the north, and connected Gillingham reach to that of Upnor, and was formerly used by boats and barges. Extensive works in connexion with the enlargement of Chatham dockyard now occupy the bed of the creek.

CHATHAM REACH, a continuation of Upnor reach, extends in a S.W. by S. direction to the old town of Chatham. On the western shore is Tower hill, and southward of it low marsh land, with Whitewall creek between; on the greater part of the eastern shore is the dockyard, ordnance department, and the marine barracks. From the west shore, abreast the dockyard flagstaff, the flat stretches across the river to the mooring buoys, or within about half a cable of the landing stairs, with a general depth of 10 and 11 feet over it at low water, and 13 to 16 feet between it and the stairs.

Between the bank and lower part of the yard the depths are from 12 to 17 feet; and between the ordnance wharf and the opposite shore from 13 to 23 feet will be found, the deepest water being along by the wharf. In the bend of the river a bar stretches across from the Sun pier at Chatham to the opposite side, over which 7 feet can be carried at low water. Vessels drawing 20 feet water, and bound down the river from Chatham, should not get under way until the last quarter flood.*

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* The depth in Chatham reach, and in the river generally, appears to be decreasing. —Staff Captain J. Loane, Master Attendant, H.M. Dockyard, Chatham, 1876.

CHATHAM.—The town stands on the right bank at the bend of the river above the dockyard. It includes that of Brompton, and adjoins Rochester so closely, by a long, narrow, irregular street, as to form rather one town than an independent city. In the town near the dockyard there are Marine barracks which give accommodation for 1,400 men, and a marine infirmary with 260 beds. The population of Chatham in 1871 was 44,135; and that of Rochester was 18,144.

The Dockyard, including the extension works now (1877), contains an area of 500 acres, and presents a line of 4,800 yards of river wall and stone faced embankment; here are seven building slips, and eight docks. The largest of the docks is 448 feet in length, and has 32 feet over the sill at high water springs. The yard employs about 3,600 men. An Act of Parliament was obtained in 1855, and the works commenced in 1867 to enclose St. Mary's marsh, and to construct in it three basins for repairing, factory, and fitting-out purposes, with four first-class graving docks opening out of one of them, which will have a depth of 34 feet over the sills at neap tides. The western or repairing basin, out of which are four graving docks, has an area of 21 acres, the centre or factory basin 20, and the eastern for fitting out 28 acres. The first two basins, the four new docks, and the entrance from Chatham reach are all at present in use. It is expected that the third basin with its two lock entrances (adapted for use as docks for special purposes), will be ready for use in 1880. It is also proposed to deepen the river to 19 feet at low water, or 35 at high water, for a channel 200 yards wide.*

LIMEHOUSE REACH, in a north and south direction, is about three quarters of a mile in length, and extends from the bend of the river to the Rochester gas works on the point opposite the chalk cliffs.

On the west side over the marshes is the city of Rochester with its ancient castle and cathedral. Having passed the bar, the water will deepen from 9 to 20 feet. Moorings are laid down in mid-channel, which are generally occupied by small vessels of war. There are two small knolls in mid-channel between the buoys, with 8 and 9 feet over them, but the water is deep on either side.

BRIDGE REACH extends from the gas works to Rochester bridges, a distance of about one-third of a mile. The depths in this reach are very irregular, varying from 5 to 23 feet, the latter depth being close up to the bridge, but a little below it is a shoal running across the reach with one to 6 feet over it. The general depths may be said to be 8 or 9 feet. Off the water-mill at Strood there is a hole having 17 and 18 feet water in it; and in the bend of the reach, between the gas works and the entrance to the old Gravesend and Rochester canal there are 14 to 20 feet. At the north side of the reach is the terminus of the North Kent, Maidstone, Chatham, and Dover railways. Steamboats run between this and Chatham, Sheerness, &c., several times a day.

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* Information as to works at Chatham, from Staff Captain R. B. Batt, Master Attendant, H.M. Dockyard, Chatham, 1877.

Near to the South-Eastern railway terminus, and connected with it, is a basin adapted for vessels of moderate draught; it is 200 feet in length, with an average breadth of 114 feet and depth of 18 feet. It is entered by a lock 120 feet long by 30 feet wide, and a depth over the sill of 16 to 18 feet at springs, and 12 at neaps.

There are several extensive manufactories of Portland cement around the district of Strood.

CHAPTER II.

THE NORTH SEA.*

The NORTH SEA, or GERMAN OCEAN, is bounded on the west by the British isles, on the east by Norway and Denmark, on the south by Germany, Holland, Belgium, and France, and on the north by the Shetland isles and the northern or Arctic ocean. The term "German ocean," though in common use, is not so comprehensive in its application to this extensive basin as that of "North sea," now more generally used by the navigators. Lying between the parallels of 51° and 61° N., and longitudes 2° 30′ W., and 7° 30′ E., its greatest length is about 600 miles, and its breadth (from St. Abbs head to the opposite shore of Denmark) 360 miles. The shores of the North sea are indented by bays, fiords, inlets, and estuaries; and the Skagerrak, an arm of it dividing Denmark and Norway, communicates, through the Kattegat, with the Baltic.

The North sea is irregular in form, being divided into two unequal portions by a line drawn from Cromer to the Texel. The northern one is contained betwixt generally bold and clear shores, and possesses a comparative uniformity of depth; the southern section, on the contrary, differs in every respect from the northern one; in no part of it is there a depth exceeding 30 fathoms, for while limited in area, it is the receptacle for the matters discharged by several rivers of magnitude, such as the Thames, Schelde, Maas. and Rhine. and the supply of ages is now seen in the masses of sand which encumber it.

The greatest depression in the North sea is upon the Norwegian side, where depths of 200 to 400 fathoms are common, and though the surface of the whole basin is irregular, the depth increases on proceeding from south to north, and thus exhibits the characteristic features of a great bay. It may also be mentioned as a general fact, that there is a greater depth of water on the eastern and western sides of the North sea than in its central parts, and also, on the whole, it is deeper on the British than on the continental shores, that of Norway only excepted.

Among the sand banks with which the North sea, as already observed, is encumbered, is first the one known to mariners as the Long Forties, and which trends from the Firth of Forth north-easterly for about 110 miles, while the Jutland banks may be traced for upwards of 100 miles in a westerly direction. The great central mass known under the common appellation of the "Dogger bank," is subdivided into the Long bank, the White bank, and the Well bank. There are besides a great number of shoals and sandbanks lying southward of the line joining Flamborough head and Helgoland: though too numerous to be particularized here it may be mentioned that on the coasts of Britain, France, and Belgium, they generally assume the form of ridges running in a direction nearly parallel to the shore or the tide streams, while the coast of North Holland alone is fronted by a broad flat.

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* *See* Admiralty charts, North sea, Nos. 2,182, a and b; scale, $m = 0 \cdot 1$ of an inch.

GENERAL DIRECTIONS.—The navigation is the most difficult in the southern portion of the North sea, partly arising from the bounding shores being so low as seldom to be visible to a greater distance than 10 or 12 miles, even in clear weather: this, taken in connection with the prevalence of fogs and misty weather during certain portions of the year, imparts to the navigation a critical character, and renders necessary the utmost caution and patient vigilance on the part of the mariner, a fact abundantly evidenced by the number of wrecks which annually takes place within its limits.

Modern surveys have made the shores of the North sea, its shallows, and its tides, generally well known, but it is greatly to be desired that the facts connected with its features and with the practice of its navigation were more generally transmitted to the Hydrographer to the Admiralty; for, were this the case, public charts and other documents would attain an excellence which they cannot otherwise possess. It is manifest, also, that no book of sailing directions for the North sea can be made so perfect in itself as to supersede the necessity for great caution on the part of the navigator using it.

Thus, his palladium will be found to be the *lead*, *log*, and *lookout*, and on the attention bestowed upon them will principally depend the safety of the ship. Other practical precautions, such as having a second anchor always ready to let go, will, of course, present themselves to the mind of the seaman. While closing the coasts, either to the eastward or to the westward, due allowance must be made for current, (*see* page 38), and when in uncertainty as to position, it must be held as far safer to heave to than to run on, or, in case of falling into shallow water, to anchor rather than to keep under way: the loss of a few hours in the passage, or the trouble of weighing an anchor, ought never, for a single moment, to be allowed to weigh against the risk of perilling life and property.

WEATHER.—A steady attention to the barometer, and to the common indications of weather in the North sea, will be found to be extremely useful. A few of these latter, contained in a manual of the barometer compiled by the late Admiral Fitzroy, and published by the Board of Trade, may here be mentioned.

Whether clear or cloudy—a rosy sky at sunset presages fine weather; a red sky in the morning bad weather, or much wind (perhaps rain); a gray sky in the morning, fine weather; a high dawn, wind; a low dawn, fair weather. Soft-looking or delicate clouds foretell fine weather, with moderate or light breezes; hard edged oily-looking clouds, wind. A dark, gloomy, blue sky is windy; but a light, bright blue sky indicates fine weather. Generally the softer clouds look the less wind (but, perhaps, more rain) may be expected; and the harder, more "greasy," rolled, tufted, or ragged, the stronger the coming wind will prove.

Also, a bright yellow sky at sunset presages wind; a pale yellow, wet; and thus, by the prevalence of red, yellow, or gray tints, the coming weather may be foretold very nearly; indeed, if aided by instruments, almost exactly. Small inky-looking clouds foretell rain: light scud clouds driving across heavy masses show wind and rain; but, if alone, may indicate wind only. High upper clouds crossing the sun, moon, or stars, in a direction different from that of the lower clouds, or the wind then felt below, foretell a change of wind.

When sea birds fly out early, and far to seaward, moderate wind and fair weather may be expected; when they hang about the land, or over it, sometimes flying inland, expect a strong wind with stormy weather. There are other signs of a coming change in the weather known less generally than may be desirable, and, therefore, worth notice; such as when birds of long flight, rooks, swallows, or others, hang about home, and fly up and down or low—rain or wind may be expected. Dew is an indication of fine weather; so is fog. Neither of these two formations occur under an overcast sky, or when there is much wind. One sees fogs occasionally rolled away, as it were, by wind, but seldom or never formed while it is blowing.

The CURRENT in the North sea in general is sensibly affected by the winds, a circumstance particularly necessary to be attended to by vessels bound from the British shores towards the opposite coast. With the winds from the south-west quarter the current sets to the east and north-eastward, generally across the Jutland bank and the south side of the Skaggerak towards the Skaw; or, varying its direction with the wind, trends towards the coast of Norway. It is therefore, necessary to be cautious that a vessel is not set ahead of her reckoning, and every attention should be paid to the lead.*

The current along the coast of Jutland northward of Bovberg sets with westerly winds about 2 miles an hour, and with strong S.S.W. gales more than 3 miles. Between the Jutland bank and the coast of Norway it generally sets to the westward even with westerly winds, and at the same time the current on the Jutland coast sets to the eastward. With northerly and north-westerly winds it sets to the southward along the coast of Norway, over the Jutland bank, and along the coast of Jutland towards Helgoland. This current, when it blows hard, runs at the rate of 1½ or 2 miles an hour, and requires particular caution.

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* *See* Tidal streams in the North sea, Section III, Admiralty Tide tables.

Between the Naze of Norway and the Orkney islands the current is very uncertain; it follows the direction of the wind, particularly when it blows from the northward or southward; but generally it runs strongest to the northward. As the wind continues the current increases, and after long continued south-west winds, it sometimes runs more than 2 miles an hour midway between the Naze and Orkneys. Easterly or westerly winds blowing athwart this current sometimes render it almost insensible in the offing; and within 9 or 12 miles of the islands, the tides take that regular course which they keep between the Orkneys and Shetland islands.

From the THAMES to the SKAW.—As the banks in the North sea occupy large portions of ground, somewhat shoaler in general than the parts surrounding them, soundings, when carefully taken, tend materially to assist in verifying the vessel's position. In navigating from port to port, the seaman will have to consider the force and direction of the wind, the tides, and his proximity to the land. Vessels from the Thames bound for the entrance of the Sleeve or Skagerrak may pass between the Shipwash and Galloper sands, or, if from the Downs, between the latter and Kentish Knock, and gain the open sea either eastward or westward of the Gabbard sands, according to circumstances.

Vessels eastward of the Goodwin, after passing the North Sand head light vessel at a distance of about 3 miles, and nearly midway between it and the Falls Tail (see Part III., page 181), should steer about N.E. by N for 26 miles, passing between the Drill stone (a ledge with 7 fathoms over a rocky bottom, causing a strong ripple), and the Fall head, about 5 miles eastward of the Kentish Knock light-vessel, and 3 miles westward of that of the Galloper. The depths of water in this track will be from 27 to 17 fathoms, and the direction of the tide stream nearly in the same line. Those whose draught will admit of crossing the shoal parts of the Falls may, with attention to the lead, skirt this ridge close up to the Galloper, as it is steep-to on either side; but, if of heavy burden, they should be careful to avoid the shoal parts.

Vessels working to the northward, eastward of the Falls, should be careful to avoid the Sandettié (*see* page 52), on which are strong ripplings, and in fresh breezes a heavy sea, which breaks on the shoalest part. Farther northward they should not stand eastward of a line joining the

Fairy and North Hinder banks; and it will be prudent for those of large draught to keep to the northward of the red buoy* to avoid the shoal part of the latter bank. At a distance of about 4 miles eastward of the Galloper a N.E. ½ N. course will lead to the northward across the parallel of 53° N., and about midway between Brown ridge and Smith knoll (*see* Part III., page 144).

In this track the soundings will be from about 30 to 20 fathoms. As the depths over Brown ridge and those eastward of it are from 11 to 15 fathoms, with deeper water between and immediately eastward of them, by attention to the lead they form an excellent guide when in this vicinity. The general depths at from 6 to 8 miles eastward of these ridges to the 10-fathoms line of soundings off the coast of Holland, are from 14 to 11 fathoms, and this space is called the Broad Fourteens; whilst for 40 miles westward of the ridges from 16 to 28 fathoms water will be found, the deepest water being to the westward.

Continuing the course N.E. ½ N. in 14 to 21 fathoms water, a vessel will cross the parallel of 54° N. eastward of the Outer Silver pit, at the south end of the Dogger bank. The Outer Silver pit extends nearly 40 miles eastward of the meridian of 2° east and 18 miles west of it; and has depths of 21 to 44 fathoms, with a small patch of 17 fathoms about one-third its length from the east end. The same course will carry a vessel probably over a 17-fathoms patch eastward of the Outer Silver pit, and in 20 to 26 fathoms water to the north-east end of the Dogger bank, in latitude 55° 30′ N., and where the soundings will be 17 and 18 fathoms.

The Dogger bank extends about 140 miles in a north-east and south-west direction, and its greatest breadth, which is at its south-west end, is about 65 miles. The bank has from 7 to 20 fathoms water over it, the shoalest part being in the centre of the south-west end, in latitude 54° 28′ N., longitude 1° 41′ E.†

About 20 miles northward of the north-east end of the Dogger bank, on the parallel of 56° N. and about 120 miles from the coast of Jutland, is the 30-fathoms line of soundings. In all cases it is better to keep well to the westward, to counteract the effect of any easterly current, as the coast of Jutland is low and not always seen until close to it. If necessary, it may be avoided by skirting the 30-fathoms line of soundings, which curves round Hantsholmen lighthouse at a distance of nearly 20 miles From Bovberg (page 265) to the Skaw, the land when seen may be recognised, and soundings obtained.

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* The position of this buoy cannot always be depended upon.

† The rather general impression that the shoal water on this extensive bank had become still shoaler and dangerous to shipping, has been dispelled by Staff Captain Parsons in *H.M.* Surveying Vessel *Porcupine*, 1875, who did not find less than 7 fathoms; this depth corresponding with that found by Captains Hewitt and Washington in 1832 and 1842 respectively.

The coast of Norway is bold, rocky, and the water deep. The Naze is a bluffish red land ; over it, a little inland, is the high land of Spangereid, generally capped in the spring with snow, and which in clear weather may be seen from a distance of 36 miles from the coast.

HOMEWARD ROUTE.—Vessels bound from the Sleeve or Skagerrak to the Thames should steer well to the northward, keep the Skagerrak open, and avoid the coast of Jutland. In working stand towards the coast of Norway, and not southward of the edge of the bank of soundings, until as far westward as the Naze ; as the current near this part of the coast of Norway sets to the westward, but does not extend far from the land. After passing the Naze a vessel will soon perceive the effects of the current, and the seaman must act according to the direction and force of the wind. Be careful not to stand southward of Bovberg with a north-west wind, in order to avoid the Horn reefs (page 259). In winter, vessels are strongly recommended to make the coast of Yorkshire somewhere about Flamborough head, thus avoiding the Yarmouth sands, and having a good departure to clear the Leman and Ower.

As the 30-fathoms line of soundings run in a W. by S. direction from the entrance of the Skagerrak almost up to Flamborough head, it is an excellent guide to vessels taking this route. By not going to the southward into a less depth, or to the northward into a greater depth, a vessel will make Flamborough head, where a gun is fired every quarter of an hour during thick weather. Vessels of heavy draught, however, commonly steer outside the Leman and Ower light vessel, and make the land between Lowestoft and Orfordness, where the soundings are regular, and the shore can be approached to a prudent distance. In approaching the coast of Norfolk, should a vessel get soundings on the Swarte or Broken banks, they will indicate her proximity to the Leman and Ower, when a sight of the light-vessel stationed on the latter bank may be obtained ; and farther to the south-west in 24 to 26 fathoms water, a vessel should be careful when standing to the westward, until to the southward of Smith knoll.

From the THAMES to FLUSHING or ANTWERP.—Vessels should steer southward of the Fairy and West Hinder banks, and north of the Bergues and Clif d'Islande or Oost (East) Dyck. An E.S.E. course made good for 37 miles from the North Foreland will carry a vessel northward of the shoal part of the Falls Tail, over that ridge in 5 or 6 fathoms, to the tail of the West Hinder, and about 2 miles south-west of its light-vessel. Then steer about E. ¾ S. for 5 miles passing northward of the Oost Dyck, when an E. by S. ½ S. course for 24 miles will lead up to the light-vessel at the entrance of the Wielingen gat.

Between the South Foreland and Wielingen gat buoy :—With the South Foreland bearing W.N.W. 5 or 6 miles, and the tide setting to the east-north-east, steer East 32 miles, then E. by S. ½ S. for the outer Wielingen buoy, and light-vessel. With the tide setting to the west-south-west, steer E. by N. 32 miles, then E.S.E. as before, passing between the West Hinder light-vessel and the north-east end of the Oost Dyck.

Hard ground indicates the vicinity of the banks, and soft ground that of the channels. When nearing the Wielingen gat buoy or light-vessel, it is better to be a little to the southward of them, so as to see the land. Bruges steeple on with Blankenburg tower is a good mark to know when abreast of the former, which is black with a staff and ball.

On the homeward route, from the Wielingen buoy, with the tide setting east-north-east, steer W. by N. ½ N. 32 miles, then W. by S. ¼ S., which will carry a vessel to the fairway off Dover. With the tide setting to the west-south-west, steer W.N.W. 32 miles, then W. by S. In thick weather borrow half a point on the French coast, as the tide at springs sets very strong to the north-east at the back of the Goodwin.

If bound to the Downs from the southward, and blowing hard with thick weather, it is better to make the North Sand head light-vessel, and haul round her to an anchorage in Margate roads, or under the lee of the Goodwin, thus avoiding the heavy sea and lee tide that sets on the South Sand head. Also the North Foreland can be approached with more freedom than the South Foreland when coming from the eastward.

From the THAMES to the TEXEL.—Vessels bound from the Thames to the Texel should take a departure from Orfordness lighthouses or the Galloper light-vessel. The entrance to the Schulpe gat lies E. ¼ N. 123 miles from Orfordness; but vessels should not make the land farther northward than Egmond or Kamperdown; nor go into less than 13 fathoms in the vicinity of the Haaks.

From the THAMES to the WESER or ELBE.—From a distance of about 10 miles eastward of Orfordness lighthouses, an E. by N. ¾ N. course made good for 155 miles will carry a vessel 15 miles northward of the Texel and the chain of low islands eastward of it, and in sight of Ter Schelling light. Then an E. ¼ S. course will lead along the land at a distance of about 15 miles over the Borkum flats, southward of Helgoland, and in sight of that light. But during northerly winds and thick weather a vessel should use the utmost caution in rounding the Texel and the low islands eastward of it (*see* page 173), and also pass outside Borkum flat in about 18 fathoms soft muddy bottom; and it will be well to heave to at about 22 miles from Helgoland, which should be sighted before closing the Elbe.

VARIATION of the COMPASS.—The amount of variation in 1878 for particular sections of the coasts included in this part, will be found at the head of each chapter, but it may be useful here to present briefly some general information on the subject.

In the North sea generally the lines of equal magnetic variation run in a N. by E. and S. by W. (true) direction and range in value from 19° W. in the river Thames at Greenwich, to 13½ W. at the Skaw ; this decrease being gradual in proceeding from West to East. At the present time the variation throughout the North sea is decreasing annually from 8′ to 10′.

The variation in London and its vicinity for every 10 years of the present century, as given in the annexed Table, indicates the nature of the changes which have taken place during those periods ; corresponding corrections from the present time for the eastern shores of the North sea should be applied, if charts of an early date uncorrected for changes of variation are employed.

Year.	Variation.		Year.	Variation.	
	°	′		°	′
1800	24	4	1840	23	23
1810	24	14	1850	22	24
1820	24	11	1860	21	14
1830	24	2	1870	19	53

CHAPTER III.

CAPE GRIS-NEZ TO DUNKERQUE.*

VARIATION in 1878.

Cape Gris-nez 17° 42′ W.	Dunkerque 17° 28′ W.

Decreasing 8′ to 9′ annually.

The COAST from cape Gris-nez trends E. by N. ½ N. 6 miles to cape Blanc-nez, the intermediate land is high, and may be seen in clear weather from 15 to 20 miles off; but beyond the latter cape the shore bends more to the eastward, the high land takes a south-east direction towards the interior, and a level plain extends from its foot to the coast, where it terminates in a low sandy shore bordered by ranges of sand-hills, the highest of which are visible only 7 to 10 miles off. Between the capes the shore forms a slight elbow, at the bottom of which is the village of Wissant, inhabited by fishermen. From about a mile eastward of cape Gris-nez, where the cliffs of that cape end, to 1½ miles north-east of Wissant, where the steep cliffs recommence, the coast is low and bordered by sand-hills.†

Cape Blanc-nez owes its name to the high chalk cliffs in which it terminates. It forms no marked projection, but its position may be recognised from a good distance at sea by the guard-house built on the summit of the steep mound which crowns it, and which is the northern extremity of a range of hills joining mont Couple. The last slopes of the high land forming the cape, as well as the steep coast in which they terminate, extends 1½ miles eastward, nearly as far as the village of Sangatte, where the low sandy shore commences, which forms the remaining part of the French coast. The sand-hills are low to within 1¼ miles of Sangatte, but they gradually rise as they approach Calais, spreading into several parallel ranges to within 2 to 3 cables of the shore.

The principal objects on this part of the coast are the windmills of Coquelles, which stand about 2 miles inland upon the last slopes of the range of hills extending eastward of cape Blanc-nez; the windmill at

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* *See* Chapter IV. of Channel Pilot, Part II.

† *See* Admiralty charts:—England, South coast, Sheet 7, Dover strait, No. 1,895; scale, *m* = 0·5 of an inch; North sea, Dover and Calais to Orfordness and Scheveningen, No. 1,406; scale, *m* = 0·3 of an inch; and North coast of France, Sheet XIV., Boulogne to Dunkerque, No. 2,610; scale, *m* = 0·5 of an inch.

Bass or Nieulay, to the northward of these; the buildings of the farm at Trouie or the Salines, situated about half way between Sangatte and Calais N.N.E. ½ E. from Coquelles windmills, are useful marks to the pilots, who call them *les maisons rouges* or the red houses; and the ramparts and citadel of Calais, which rise above the sand-hills, and may be seen some distance at sea.

The beach in front of Sangatte is only a quarter of a mile wide at low water, but near the west jetty at Calais it dries out half a mile. Within a quarter of a mile of the beach there are several shoal patches of 7 and 8 feet, and no vessel should get amongst them at low tide.

LIGHT.—The lighthouse, a round tower, 79 feet high, on cape Gris-nez is erected at a quarter of a mile to the southward of the cape, about 100 yards from the edge of the cliff, and exhibits, at an elevation of 226 feet above high water, a white *revolving* light, the eclipses of which succeed each other every *half minute.* The light is electric, of the first order, and visible in clear weather at 22 miles; the eclipses are not total in ordinary weather within the distance of 12 miles.

This light cannot be mistaken for the light of Calais, which is varied every *four minutes by a flash,* preceded and followed by short eclipses.*

LA LIGNE BANK.—The great prominence of cape Gris-nez, and the sudden change there in the direction of the coast, occasions an extensive eddy to the north-east of it during the flood. This eddy has no doubt caused the formation of this bank of sand and broken shells, which extends E.N.E. 4 miles from the cape, and nearly 2 miles from the shore abreast Wissant. Its shoalest part uncovers at low tide, and towards its north-east extreme several heaps of sand, named the Barrière, have been formed, upon the highest of which are only from 4 to 9 feet of water; the sea runs high upon them when it blows fresh on a weather tide.

The south-west end of the Ligne bank has gradually joined itself to the cape, no longer leaving a passage for fishing boats at low water; a new passage, called the North-west channel is formed near the middle of the bank.

Buoy.—A red buoy with a triangular top, marks the north-east extreme of the Barrière sand. From the buoy Wissant bears S. ½ E. nearly, and cape Gris-nez lighthouse S.W. ¾ W.

Les Gardes Rocks.—The shore between capes Gris-nez and Blanc-nez is bordered by a sandy beach, uncovering in some places 4 cables out at low water. In front of all the steep parts of the coast there are rocks rising from the sand, and amongst them and farthest from the shore are those named the Gardes, which uncover 7 feet at the lowest tides; from their outer extreme Wissant church tower bears S.W by S. 2 miles, and the guard-house on cape Blanc-nez E. by N. nearly 1½ miles.

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* With a view of indicating the position of the Varne and Ridge shoals in Dover strait, a light-vessel, exhibiting a *quick revolving red* light, is moored near the south-west end of Varne. A gong is sounded during foggy weather.

LES QUENOCS and LE ROUGE RIDEN FLATS.—A rocky bottom, joining the shore and partly covered with sand, extends from the Gardes to Sangatte village, and two miles into the offing between the bearings of N.N.W. and E.N.E. of cape Blanc-nez, and its shoalest part forms two distinct dangerous flats of irregular rocks.

The western flat, named Quenocs, is about half a mile in diameter, and from its shoalest head of 7 feet, the guard-house on cape Blanc-nez bears S. by E. ⅓ E. about 1½ miles, and Sangatte church tower E. by S. ¾ S. 2¼ miles.

The second flat, named Rouge Riden is nearer the shore, and nearly a mile in extent from W.S.W. to E.N.E.; from its shoalest head of 7 feet the above guard-house bears South one mile. A shoal head of 9 feet also lies on the eastern edge of this flat, with the guard-house bearing S.S.W. ¼ W 1¼ miles, and the church tower E.S.E. 1½ miles. The sea runs high on both flats when it blows fresh on a weather tide. Sangatte church tower seen between the two windmills at Coquelles, bearing S.E ¼ S., leads half a mile to the northward of the Rouge Riden.

Buoy.—A bell buoy lies in deep water off the north side of the Quenocs, W. ½ N. 6 miles from Calais pier head, and N.E. by E. ⅓ E. about 2½ miles from the buoy of the Barrière.

LE RIDEN de CALAIS, about 4 miles long in a N.E. by E. and S. W. by W. direction, commences N. by E. 1½ miles from Sangatte, and ends N. ½ E. about 2½ miles from the entrance to Calais. The general depth on this bank varies from 5 to 8 fathoms; there are three heaps of sand towards its centre extending nearly 1½ miles in length, upon the shoalest parts of which are only 20 to 22 feet water. The bank is dangerous at low water for vessels of large draught; it also occasions strong eddies, and during fresh winds from the northward there is a heavy sea on it, and breakers in north-east gales.

LES RIDENS de la RADE, also named the Têtes, lie N.N.W. one mile from Calais pier-heads, and when this coast was surveyed in 1836 they consisted of several heaps of sand, upon the highest of which were 4 fathoms at low water. Since that period they have been sensibly on the increase, and in 1857 there were only 2 fathoms over the highest head. Another head, with only 1¼ fathoms on it, and on which the fishing boats sometimes ground, lies about half a mile N.E. of the extremity of the east jetty. A heavy sea runs upon them when the wind blows upon the shore.

Buoys.—In the centre of the deep between the Quenocs and the Riden is a black buoy with a perch and cross, W. by N. ½ N. about 4¼ miles from Calais pier-heads, and E.N.E. 2 miles from the bell buoy. At the outer north-east extreme of the Riden is a red perch buoy with globe, in 10 fathoms with Calais pier head S. by W. 2¾ miles; and Walde lighthouse S. E. ¼ E. 3½ miles; and the black and white chequered buoy with perch at the west extreme of the Out Ruytingen (page 54) N.E. by N. ¼ N. 4½ miles.

CALAIS ROAD, comprised between the Riden de Calais and the beach to the westward of Calais harbour, affords anchorage with off-shore winds to vessels which may arrive off the harbour a few hours before the tide will permit them to enter. A convenient position, in about 9 fathoms water and a mile off shore, is with Sangatte church tower in line with the guard-house on cape Blanc-nez, W. by S. ½ S., and Calais lighthouse S.E. ½ E. At night keep cape Griz-nez light opening and shutting with the cliffs at cape Blanc-nez, and anchor when Calais light bears S.E. ½ E.

The road carries a depth of from 10 to 14 fathoms towards the Riden de Calais, and 7 to 9 fathoms at half a mile from the steep edge of the beach, over a sandy bottom mixed with broken shells; but the pilots say that the anchors penetrate into a good holding ground beneath the sand, and that ships of the line and frigates have rode out a north-west gale without driving, when anchored under the southern part of the Riden. The holding ground is not so good near the shore.

The road is sheltered by the land from W.S.W., round south, to S.E., but it is quite open to all other points of the compass. The Riden cannot be considered as a shelter, although the waves break with great violence during a northerly gale on its whole extent; the sea, however, is much quieter here than in the offing, and with good ground tackling, a vessel might ride out a gale in the northern part of the road.

CALAIS.—The port of Calais consists of a tidal harbour and a small basin named Paradis, which dries at low water; a floating basin under the ramparts of the citadel, in which the largest vessels that can enter the harbour lie afloat; and a reservoir containing the scouring water, The entrance, which is between two wooden jetties, lies 11½ miles to the eastward of cape Griz-nez, S.E. ¼ S. 22 miles from Dover, and S.E. ½ S. 20½ miles from the South Foreland. Vessels of about 20 feet draught can enter the harbour at high water ordinary springs, in fine weather when the sea is smooth, and of 15 feet at ordinary neaps; but those seeking to enter during northerly winds, when the sea is not too high at the entrance, should not attempt it if their draught is above 17 feet, at springs, or above 12½ feet at neaps. The average depth on the bar at the lowest tides is about 5 feet, and 7 to 8 feet at the neaps, but it varies with the wind.*

With W.S.W. gales, which render the navigation of the English channel so dangerous, the tide will rise a foot or two higher; and it should be remembered that during springs, when it blows strong between West and South, and Boulogne is impracticable, Calais can be entered; on the contrary, when it blows hard between North and E.N.E., and it is impossible to enter Calais, Boulogne can be entered.

Calais has some foreign and a brisk coasting trade, and the vessels belonging to the port are chiefly employed in the cod, herring, and mackerel fisheries. In 1872 the population was 12,843, and that of Saint Pierre 20,409, and the number of vessels entered inwards in 1868 was 586. The imports were salt, colza, oil, fish, coal, cordage, rails, cast iron, wood, woollens, cottons, machinery, &c. &c.; the exports, wines, silks, Parisian goods, perfumery, &c. &c. There were also at that time 14 pilots, 5 pilot vessels, and 103 fishing vessels, amounting to 3,605 tons, and manned by 721 men. The English and French mails cross the channel between Dover and Calais, the distance being accomplished under ordinary circumstances in 1¾ hours.

The entrance channel is about 263 feet wide, and runs 6 cables S.S.E. from the entrance, between jetties lengthened out 807 feet by open pilework, which is crossed as well as that part of the channel it encloses, by the flood and ebb streams. This arrangement prevents the sand from accumulating in front of the entrance, but it is a serious inconvenience to vessels entering or leaving at high water, as the stream outside is then running at its greatest strength.

The harbour begins where the east jetty joins the wall of the quay at the eastern part of the town. This wall continues along the whole length of the harbour, except where it is interrupted by the entrance to the Paradis basin, and by the sluice of the citadel ditch. The quays are spacious, their surface being 27 feet above low water. That part between the Paradis basin and the east jetty, named the Courgain or Colonne quay, is where vessels that arrive after high water, or those preparing to quit the harbour, are placed, and about one half of the quay between the entrance to this basin and the citadel sluice is reserved for the mail and passage steamers; the other half is given up to merchant vessels. There is a careening slip in the harbour, and a large crane, which may be used for masting.

The floating basin has a surface of 20,000 square yards, with 590 yards extent of quays. The entrance between the gates is 54 feet wide, and their sill is 3 feet 2 inches above the lowest tides. Both the harbour and floating basin are well sheltered from wind and sea; a swell, however, runs into the entrance channel, the harbour, and the Paradis basin, from half flood to half ebb when it blows strong from the northward, and vessels that are then along the Colonne quay strike heavily upon a hard shingle bottom.

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* *See* Admiralty plan of Calais, No. 2,556; scale, $m = 15$ inches.

Life boats.—There is a life-preserving apparatus at Calais, and two life boats; one stationed on the east, the other on the west side of the harbour.

LIGHTS.—Calais lighthouse, octagonal and 167 feet high, stands in one of the angles of the fortifications at the north-east side of the town, and exhibits, at 190 feet above high water a *fixed* white light varied every *four minutes* by a bright *flash*, preceded and followed by short eclipses, which are not total in ordinary weather within 12 miles. The light is of the first order, and visible in clear weather at 20 miles.

A *fixed red* light, elevated 23 feet, and visible 4 miles off, is exhibited on a mast at the extremity of the west jetty, unless the entrance to the port is impracticable.

Tidal, a *fixed* white light is exhibited from a turret at the extremity of the east jetty, from an elevation of 39 feet, which can be seen about 9 miles off. Two small *red* lights are also shown thus:—the white light alone indicates a depth of 10 feet up the channel, a *red* light below the white one, 13 feet; a *red* light above, 16 feet; and the three lights together, 20 feet. A bell is sounded in foggy weather.

DIRECTIONS from the WESTWARD.—As a general rule, cape Blanc-nez is the landfall that should be made when bound either to Calais, Gravelines, or Dunkerque. The most favourable winds for entering Calais harbour are those from W.S.W., round north, to East. When those that blow upon the coast are moderate they only cause a heavy swell on the beach, but when they are strong they send in a heavy sea, and it is then dangerous to enter. Under these circumstances, which are frequent in winter, vessels bound for the northern ports of France should immediately run for Boulogne.

Vessels running for Calais from the south-west should, when on the parallel of cape Gris-nez and about a mile from it, steer about N.E. by E. ½ E., taking care not to bring the extremity of the cape to the westward of S.W. by W. in order to keep outside the Barrière and the Quenocs rocks; when Sangatte church tower is in line with Coquelles windmills, bearing S.E. ¼ S., steer E.S.E., passing the black buoy on the port hand, for the centre of Calais, until Audinghen church tower is hid behind the cliff at cape Blanc-nez, when, if there is water sufficient to enter the harbour, a course should be shaped for the entrance; if not, an anchorage should be sought for in the southern part of Calais road.

The largest vessels that the harbour will admit may pass at all times of tide between the Queenocs and the Barrière, by keeping Sangatte church tower in line with either of the three towers of Calais; they may also pass between the Rouge Riden and the shore from half flood to half ebb.

At Night cape Gris-nez light should not be brought to the westward of S.W. by W. to avoid the Barrière and the Quenocs, and when Calais light bears E.S.E., steer E. by S.; then, if the ebb is running, anchor as soon as cape Gris-nez light is about to be hid behind the cliff at cape Blanc-nez; but if the flood, and there is sufficient water at the entrance, steer for the *red* light on the west jetty head, which must be rounded close to.

From the NORTHWARD.—Vessels bound to Calais from the northward with a fresh fair wind may, between a third flood and two-thirds ebb in the harbour, run either by day or night directly for the entrance over the Riden de Calais, as there is sufficient depth on that shoal at that time of tide. If late on the ebb, run on the meridian of cape Blanc-nez until Sangatte church tower is in line with Coquelles windmills, S.E. ¼ S., then steer, if the weather is favourable, for the anchorage in the southern part of Calais road.

At Night steer for Calais light on an E.S.E. bearing, until cape Gris-nez light bears W.S.W., then, attending to the lead, steer E. by S. until the light on cape Gris-nez is just hid behind cape Blanc-nez, when anchor, if the ebb is running, or if the flood, steer for the harbour.

Entering the Harbour.—The most favourable time for entering the harbour, when the wind blows upon the coast is at the moment of high water; but with the wind abeam or ahead, at half or three quarters of an hour before that period, so as to have time to be tracked up to the quays, or into the floating basin. It should, however, be borne in mind that during calm weather, at half a mile outside the entrance, the flood stream continues to be felt 2½ or 3 hours, and with strong westerly winds 4½ and 5 hours after high water in the harbour, and it is at its greatest strength at the time of high water there. For this reason, whatever the direction of the wind, the end of the west jetty should be steered for, to avoid being set to the eastward of the entrance, and this precaution is particularly necessary when standing for the harbour on the starboad tack; the bower anchors and a stern anchor should then be ready for letting go, and hawsers to run out in the event of being drifted on the east jetty. All sail should be carried, especially with the wind right aft, to stem the flood and to pass quickly through the swell at the entrance. Should a vessel with a strong westerly wind and without a pilot miss the entrance, she must anchor immediately, as near as possible to the end of the east jetty, and take a pilot, whose assistance will then be indispensable.

Vessels may get out of the harbour and gain an offing with a head wind, by making sail from the end of the west jetty on a weather tide.

TIDES.—It is high water, full and change, in Calais harbour at 11h. 49m., and the tide rises above the water in the entrance channel 19½ feet at ordinary springs, 22 feet at great springs, and 15½ feet at ordinary neaps. The tides rise higher with strong winds from N.W. to W.S.W. than they do with those from East to S.S.E.

The depth of water at Marée quay alongside the east jetty is at high water springs, 31¼ feet; at low water, 10½ feet. At the Commerce quay, at high water springs, 22½ feet; at low water 1½ feet.

The mean duration of the flood-stream at springs in front of the entrance is 5½ hours, and of the ebb 7¼ hours. At half a mile outside the piers the flood runs 2½ or 3 hours after high water in the harbour, and with strong westerly winds, 4½ or 5 hours; with easterly winds it continues only 1½ or 2 hours. The rate of the flood at great springs is 4½ knots. The slack at high water springs continues about 20 minutes, and large vessels can be moved in the harbour during the space of 1½ hours; at neaps the time of slack often amounts to three-quarters of an hour.

The tidal signals are hoisted on a mast and yard from a blockhouse built on piles to the westward of the west jetty, and are the same as those generally used on the French coast, with this exception, that the flags are hoisted when there are 8 feet water at the jetty heads, instead of 6½ feet, and lowered as soon as the water has fallen to that level, *see* page 81.

BANKS OFF THE NORTH COAST OF FRANCE.—The approach to this low dangerous coast is obstructed by numerous banks, composed of gray and black sand, which extend 15 miles from the shore on the meridian of Calais, and 42 miles in a N.E. direction from Dunkerque. Their shoalest part may be touched upon by vessels of almost any draught, and the eddies they occasion cause a hollow sea, and the waves break upon upon them when it blows hard. Those farthest from the land lie on the eastern limit of the 20 fathoms soundings, which form in the southern part of the North sea, the deep, known as the Deep-soundings channel, which begins at Dover strait, and ends at about lat. 53° 20′ N.

The banks are all steep-to on their inshore edge, and spread in a gentle slope towards the offing; and as at the foot of these submarine banks which are composed of sand, gravel, and broken shells, there is less than 20 fathoms at low water, a simple method is afforded to avoid getting amongst them by not going into less than that depth at that time of tide. The lights at cape Gris-nez and Calais are in a good position to point out at night their western limit; and the *revolving* light at Dunkerque, seen in clear weather at 25 miles, will give notice of approach to a greater part of them; and the navigation is further facilitated by the two light-vessels moored within the Hinder banks, that north-east of the Ruytingen, and others farther in shore. The dangers in the navigation along the shore can only be avoided by placing the vessel under charge of a good pilot; but, generally speaking, none of the banks should be approached except a vessel is bound for one of the harbours on the coast.

These banks are divided into two groups; those nearest the shore are named the Dunkerque banks, and the others lying at some distance from the coast, were not well known until the late *Captain* W. Hewett, R.N., surveyed them in H.M.S. *Fairy* between the years 1831–1840.

DUNKERQUE BANKS, eleven in number, extend 15 miles from the coast between the meridians of Calais and the frontier of Belgium. Their names are, the Sandettié; the Out-Ruytingen; the In-Ruytingen; the Bergues; the Dyck (the north-east part of which is called the Clif-d'Islande or East Cliff; the In-Ratel; the Out-Ratel; the Haut-fond de Gravelines; the Breedt; the Smal; and the bank which bounds Dunkerque road to the northward, and which is composed of several parts united together, named, Snouw, Braeck, Hils, and Traepegeer. The other banks, six in number, lying to the northward of the Dunkerque banks, are the Fairy; North Hinder; West Hinder; East Hinder; Bligh; and the Thornton Ridge.

SANDETTIÉ BANK (in Flemish the Zan-detié, called also the Ourting by the mariners on this coast), the most western of the Dunkerque banks, is about 12 miles long, in an E. by N. and W. by S. direction, and its breadth varies from 4 to 9 cables. Its south and south-east edges are steep-to, having from 19 to 20 fathoms water at less than half a cable from the southern edge, but its slope is more gradual towards the north-west, and this side may easily be avoided by the lead.

There are two shallow flats on this bank, over which it would be dangerous to pass in bad weather. The northern flat, with only 21 feet water on it, lies N.N.W. ¾ W. 18 miles from Dunkerque lighthouse, and N.E. ¾ N. from that at Calais; and the southern flat, on which there are only 19 feet, lies W. by S. 3½ miles from the northern flat, N.W. ⅓ N. from Dunkerque lighthouse, and N.N.E. ½ E. from that at Calais. Besides these flats, there are other heaps of sand, with from 21 to 25 feet on them, spreading 1½ miles in a W. by S. direction from the southern flat; but the depths vary from 31 to 46 feet upon the other parts of the bank.

The Sandettié, rising suddenly from the bottom, causes strong ripplings, and when it blows fresh the sea is heavy around it, and breaks upon the flats. From the south-west end of the bank, which is steep-to, in 8 fathoms at low water, the following lights may be seen in clear weather:

—cape Gris-nez, S.W. 21 miles; Calais, S. by W. ¼ W. 13 miles; Gravelines, S.S.E. ¼ E. 15 miles; Dunkerque, S.E. ⅓ E., just visible; and South Foreland lights, W. by N. ¼ N. 17 miles. In the daytime, if the weather is clear, the summit of mont Couple may be recognised, S.W. by S. distant 19 miles: also, the South Foreland, and the white cliffs near Dover, bearing W. by N. The north-east end of the bank, upon which there are 8½ fathoms at low water, lies N. by W. ½ W. 18 miles from Dunkerque lighthouse, and N.W. by N. ¾ N. 6¾ miles from Ruytingen light-vessel.

OUT-RUYTINGEN BANK, lying midway between the coast of France and the Sandettié, is separated from the latter by a channel from 5 to 6 miles wide, with soundings of from 14 to 21 fathoms in it. Its western end is about 7 miles from the shore on the meridian of Calais lighthouse, and thence it extends 7 miles to the eastward, and then curves 9 miles to the E.N.E. terminating at 12 miles N. ½ W. from Dunkerque lighthouse. The bank rises almost perpendicularly from the bottom on its south-eastern side, and then falls in a gentle slope to the north-west. Those parts upon which there are less than 5 fathoms water, form 2 flats, 2½ miles apart, with from 5 to 10 fathoms between them; the latter depth lies N.N.W. from Gravelines lighthouse and N.E. from that at Calais, and vessels bound to either of these ports can pass between the flats in this direction at any time of tide.

The Dyck light-vessel just open eastward of Gravelines light will lead through the passage between the Great and Little banks of Out-Ruytingen.

The western flat of the Out-Ruytingen is 3 miles long, East and West, and half a mile broad, and from its shoalest spot, upon which there are only 10 feet water, the church tower of St. Pierre-les-Calais appears in line with Fienne windmill S.W. by S. southerly; Calais lighthouse S.W. ¾ S. 8½ miles; Gravelines lighthouse S.S.E. ¾ E.; and Dunkerque lighthouse S.E. by E. ¼ E.

The eastern flat is 9 miles long, and half a mile wide, and on its northern part are patches of sand, upon the shoalest of which are only 12 feet water; on the other parts of the flat the depths vary from 18 to 23 feet.

The Out-Ruytingen occasions strong eddies, and when it blows fresh, the sea which breaks upon its shoalest parts, is also heavy upon its edges. There are some irregularities of the bottom, with 6 to 9 fathoms water on them, to the westward of this bank, as far as N. by W. from Calais, and small vessels should avoid crossing them in bad weather.

LIGHT-VESSEL.—At about one mile from the east end of Out-Ruytingen in 8 to 10 fathoms water is moored a light-vessel exhibiting a *revolving red* light, eclipsed every *thirty seconds*; the light is elevated 33 feet above the sea, and should be seen in clear weather from a distance of 11 miles. The vessel is painted red, and her name on each side in white letters, with a red ball at the mast-head, and lies with Calais lighthouse bearing S.W. by W. ½ W. 20 miles; Gravelines S.W. ¾ S. nearly 13 miles; and Dunkerque S. by E. easterly 11½ miles.

A bell is sounded in foggy weather.

Buoys.—Along the northern margin of the Out-Ruytingen are three black perch buoys. The North-east buoy, No. 3, with a diamond, lies W. ¼ S. 1¾ miles from the light-vessel in 10 fathoms water; the Middle buoy, No. 5, with a cylinder, bears S.W. by W. ⅓ W. 4 miles from the last, N.W. ⅓ N. from Dunkerque lighthouse, and N.E. by E. from Calais; the South-west buoy, No. 7, with a cone point upwards lies in 8 fathoms W. ½ S. 3¾ miles from the Middle buoy, and N.E. ¼ E., nearly 11 miles from Calais lighthouse.

The three buoys of the western flat or Out-Ruytingen Little bank, are the North buoy, No. 2, red, with a cone, point downwards, at the north end in 6½ fathoms, N.W. by W. ¾ W. 2 miles from No. 7 the South-west buoy, and N.N.W. 9½ miles from Gravelines lighthouse; the South buoy, No. 4, red, with two cones, in 11 fathoms, W. ½ S. 3 miles from the black No. 7 South-west buoy, N.W. ⅓ N. 5¾ miles from the Dyck light-vessel, and N.E. ⅔ N. 8½ miles from Calais lighthouse; the West buoy, No. 9, is black and white chequered with cone and ball, it lies in 6½ fathoms W. by N. 2½ miles from the South buoy, N.W. ¼ N. 10¾ miles from Gravelines lighthouse, N. by E. ¾ E. 7⅔ miles from Calais lighthouse, and N.E. by N. ¼ N. 4⅓ miles from the North-east red perch buoy of the Riden.

IN-RUYTINGEN BANK lies 2½ miles to the eastward of the Out-Ruytingen, and including all the shoal soundings of less than 8½ fathoms, it is 8 miles long, W.S.W. and E.N.E., and 3 miles broad. Dunkerque lighthouse bears from its western extreme S. by E. ¾ E. 9¾ miles, and S. by W. ⅔ W. 12½ miles from its north-eastern extreme.

The In-Ruytingen is of a triangular form, and the irregular soundings on it cause an uneasy sea. Those parts on which there are less than 26 feet water, form two flats, separated from each other by soundings of from 5 to 6 fathoms. The western flat, which occupies the centre of the bank, is 2½ miles long, North and South, and 2 miles wide, with as little as 9 feet on it, which depth lies with Dunkerque lighthouse seen midway between Cassel and the spires at Bergues, bearing S. ⅓ E., and Ruytingen light-vessel N.W. ⅓ W. 2½ miles. The eastern flat lies on the north-east part of the bank, and is 1½ miles long, and its shoalest spot has 14 feet on it. The channel separating the In-Ruytingen from the Out-Ruytingen carries a depth of from 15 to 8 fathoms, and vessels can pass through it by keeping Gravelines lighthouse S.W. ¾ S. the line of bearing from Ruytingen light-vessel.

BERGUES BANK lies a mile to the northward of the north-east flat on the In-Ruytingen, with from 9 to 14 fathoms water in the channel which separates them, and from the least depth on it, 23 feet, Dunkerque lighthouse bears S. ¾ W. 13½ miles. The eastern end of the bank is on the meridian, and 15 miles distant from Dunkerque, and thence it extends 3½ miles to the W.S.W. Some ridges or ridens, with 6 to 7 fathoms on them, extend for 4 miles to the East and E.N.E. of the shoalest part of this bank, and when the wind blows fresh on a weather tide, a heavy sea runs in the eddies formed on their edges, as well as on the edges of the Bergues.

Buoy.—A black buoy, No. 1, with a ball, lies in 11 fathoms water north of the shoalest part, N. ¾ E. from Dunkerque lighthouse, N.E. by E. ¾ E. 5 miles from Ruytingen light-vessel, and S.W. by W. ½ W. 8 miles from West Hinder light-vessel.

WEST DYCK, MIDDLE DYCK, and EAST DYCK form one continued narrow shoal, the several banks on which are separated by soundings of less than 6 fathoms at low water. The south-west end of this shoal commences N.E. ¼ N. 6 miles from Calais lighthouse, and thence runs to the eastward parallel to the coast for 18 miles, or as far as the meridian of Dunkerque, and then trends E.N.E. 13 miles. That part which lies between its western extreme and the meridian of Gravelines is named the West Dyck or Orteil; the centre part, between Gravelines and Grande Synthe, the Middle or real Dyck; and the eastern part is generally known as the East (Oost) Dyck, or Clif-d'Islande.

West Dyck is 9 miles long, and its greatest breadth is about half a mile. From the least depth on it, of 15 feet, Gravelines lighthouse bears S. ⅓ W. 5½ miles. To the distance of 2½ miles east and west of this shoal spot the depths are from 19 to 25 feet, and towards the western extremity of the bank, N.E. ⅓ E. from Calais lighthouse, a small patch of 27 feet has been found. Small vessels should avoid passing near some patches of 7 and 8 fathoms, which lengthen out this bank to the westward nearly as far as the meridian of Calais, as there is a confused sea on their edges when it blows fresh on a weather tide.

Middle Dyck is one continued flat, 6 miles long in an E. by N. and W. by S. direction, and from half to three-quarters of a mile broad, and has from three-quarters to 5 fathoms on it at low water. It begins N.N.E. ¾ E. 6 miles from Gravelines lighthouse, and ends N. ½ W. 7 miles from that at Dunkerque.

The shoalest part of this flat is 4½ miles long, and covered with heaps of sand upon which the depths vary from 5 to 9 feet. The centre of the largest heap, lying 1½ miles from the eastern end of the flat and N. by W. ¾ W. from Dunkerque lighthouse, is extremely dangerous, being steep-to on all sides, but especially towards the north-west, where at 2 cables distance there are from 14 to 15 fathoms water. Gravelines lighthouse S.W. ¾ S. leads between Middle and West Dycks in about 20 feet water.

East Dyck or Clif-d'Islande is separated from the Middle Dyck by a channel about a mile wide, in which the depth is about 5 fathoms.

The south-west end of this bank lies N. ½ E. 7 miles from Dunkerque lighthouse, with mount Cassel seen a little open to the right of the great tower of the city, and 12 miles N.E. by E. ½ E. from Gravelines lighthouse, and from thence it trends N.E. by E. 14 miles. It is very dangerous throughout its whole extent, as it rises abruptly like a wall from soundings of from 11 to 17 fathoms. Its shoalest part, which is a flat 3 miles long, and upon which there are only from 6 to 9 feet water, commences on the south-west end of the bank, and extends to the north-east as far as the meridian of Dunkerque lighthouse. The flats formed on the rest of the bank have irregular depths, varying from 10 to 17 feet.

The north-east end of the East Dyck, where the depths are only from 3 to 4 fathoms, and around which the sea is always disturbed, is a formidable danger, as it rises abruptly from soundings of 15 and 17 fathoms, and therefore difficult to be avoided by the lead, however quickly it may be hove. The shoal spot of 3 fathoms lies N.E. ½ N. 19 miles from Dunkerque lighthouse, and 16 miles N.W. from Ostende lighthouse; but as this end of the bank is so far from the land, the most remarkable objects cannot be recognised, even from the mast-head, unless the weather is very clear; Dunkerque light, however, may be seen 5 or 6 miles farther off in clear weather.

LIGHT-VESSEL.—The Dyck lies within the West Dyck shoal in 11 fathoms, in lat. 51° 3′ 18″ N., and long. 2° 3′ 29″ W., bearing N. by W. ¾ W. nearly 3 miles from Gravelines pier lighthouse. She exhibits two *fixed* white lights elevated 23 and 34 feet above the sea, which in clear weather should be seen about 11 miles. The vessel is painted red with her name on each side, and carries a red ball at each masthead.

IN-RATEL BANK is, properly speaking, only a branch of the Middle Dyck, to the south-west end of which it is joined by a narrow sandy ridge. The bank is high and steep-to on all sides, and from its south-west end in 22 feet, which lies N. by E. 5½ miles from Mardick tower, it trends E. ¾ N. 7 miles, where, on its eastern end, depths of 18 to 19 feet rise suddenly from soundings of 7 to 8 fathoms at 6½ miles N.N.E. ½ E. from Dunkerque lighthouse. Its extreme breadth, of about a mile, is towards the middle of the bank, where there is a shoal flat 2 miles long, with only from one to 6 feet on it at the lowest tides. From this dangerous spot of one foot Dunkerque lighthouse bears S. ¾ E. 5½ miles.

The channel separating the In-Ratel from the Breedt is barred between the western flats on these banks by a heap of sand, upon which there are about 4¾ fathoms water. There are 8 and 12 fathoms in this channel at a short distance East and West of the bar.

OUT-RATEL is an isolated bank, about a mile in breadth, lying to the south-east, and parallel to the East Dyck, from which it is separated by a deep channel 2½ miles wide. Its name, meaning rattle, is perhaps derived from the noise of the heavy sea which runs upon it in bad weather. Near its south-west end, at about a mile to the northward of the east end of the Breedt, is a dangerous flat, with only 7 feet water on it. This shoal spot lies N.E. ¼ N. 10 miles from Dunkerque lighthouse, and thence the bank extends N.E. by E. ¼ E. 8½ miles, including the shoal patches projecting a mile from its north-east extreme.

The Out-Ratel, having many dangerous flats on it, ought not to be crossed, even by small vessels, without using great prudence. It is separated from the East Dyck, as well as from the eastern end of the Breedt, by soundings of from 7 to 12 fathoms. A small bank, with only 4¼ fathoms on it, lies N.N.W. ¼ W. 1½ miles from its north-east end, and is separated from it by soundings of 10 to 13 fathoms. By not bringing Ostende lighthouse to the eastward of S.E. ½ S. a vessel will keep to the northward of the banks lying between the East Dyck and the Middelkerke bank, which latter is the most western of the Ostende banks. These banks will also be cleared with the West Hinder light-vessel, bearing N.W. westerly, but attention must be given to the lead, which should be kept hove.

HAUT-FOND de GRAVELINES is a small flat of sand nearly a mile in extent, lying 2 miles to the westward of the west end of the Breedt bank. From the shoalest spot, 18 feet water, Gravelines lighthouse bears S. by W. ½ W. 3¾ miles, Dunkerque lighthouse open north of the Snouw light-vessel, S.E. by E. ¾ E. 10 miles, and Dyck light-vessel W. ½ S. 2 miles.

BREEDT BANK, the broadest of the Dunkerque banks, joins the In-Ratel by a bar of sand with 4¾ fathoms water on it. Its western extreme, where the most dangerous parts commence, lies N. ¼ W. 3 miles from the high sand-hills on Gravelines point, N.E. ¼ N. 4¾ miles from Gravelines lighthouse, and N.W. by W. ¼ W. 8 miles from that at Dunkerque. From thence it trends E. ¾ S., 6½ miles, and then E. by N. ¾ N. 8 miles to its eastern extreme in 4 fathoms water, which lies N.E. ½ E., 9¾ miles from Dunkerque lighthouse, and N.N.W. ¼ W., 9½ miles from Furnes.

There are three dangerous flats upon the Breedt. The western flat, with 3 feet water on it, lies 3½ miles from the shore, and from its centre Mardick church tower bears S. ¼ W. The middle flat, the highest part of which uncovers 5 feet at the lowest tides, is of an oval shape, 2 miles long and 1½ broad. From the part which dries Dunkerque lighthouse bears South 3½ miles. The third flat, 3½ miles long and one third of a mile broad, begins N.E. by N. 4 miles from Dunkerque lighthouse, and ends about W.S.W. 2 miles from the eastern end of the bank : there is a depth of only 6 feet on its western point, and the remainder of the flat carries from 8 to 9 feet ; the western end is separated from the eastern edge of the middle flat by a space of 1½ miles, with 2 to 3 fathoms water in it.

EAST BREEDT BANK is three-quarters of a mile wide, and carries from 13 to 18 feet. A narrow channel, 5 miles long in an E.N.E. and W.S.W. direction, and in which the depths are from 4½ to 8 fathoms, separates the north-east end of the Breedt from the south-west extreme of the East Breedt ; this extreme lies N.E. by E. 14½ miles from Dunkerque lighthouse, and thence the bank extends N.E. by E. 5 miles, and terminates in some shoal patches of 25 feet, the most northern of which lies a little to the eastward of the meridian of Furnes, and N. ¼ E. from Nieuport. From this position Dunkerque lighthouse bears S.W. by W. 20 miles, and Ostende lighthouse S.E. ⅓ E. 10 miles.

SMAL BANK, the western end of which lies 2¼ miles from Dunkerque lighthouse, with the lighthouse in line with Dunkerque tower, is connected with the middle flat on the Breedt bank by soundings of from 15 to 22 feet water. From its western end it trends E. ¼ N. 6 miles, and then N.E. by E. ¾ E. 8½ miles to its north-east end, which lies about N. ¾ E. 9¼ miles from Furnes, and N. by W. ½ W. from Nieuport. The southern part of this bank bounds Nieuport road to the north, and is extremely steep-to.

A dangerous flat, about 8 miles long, and carrying from 2 to 7 feet water, rises from the Smal bank, commencing N.E. ½ N. 3 miles from Dunkerque lighthouse, and extending without interruption as far as N. by W. ¼ W. from Furnes. It is joined to the flat on Hils bank by shoal water of from 9 to 13 feet, the centre of which lies with Dunkerque tower seen just open to the eastward of Leuguenaerd tower. Between the east end of the flat and the north-east extreme of the bank are several isolated patches, upon which there are only 9 to 16 feet water.

The Smal bank is joined to the Nieuport bank by a narrow bar, with 18 feet on it at low water, lying 3¼ miles from the shore, with the towers of Furnes in line with the eastern part of a high sand-hill, named Broers duyn, bearing S. ¼ W.

SNOUW BANK.—The successive parts of the bank which bounds Dunkerque road to the northward are named Snouw, Braeck, Hils, and Traepegeer. The western portion of Snouw bank is 4 miles long in an E. ½ S. and W. ½ N. direction, and its highest parts form a narrow flat 2½ miles long, with as little as 2 feet water on it. The western end of the Snouw is 2 miles from the shore, N.E. ⅔ E. 4 miles from Gravelines lighthouse, and N.W. by W. ¾ W. $7\frac{3}{10}$ miles from Dunkerque lighthouse.

LIGHT-VESSEL.—The Snouw lies in 11 fathoms E.N.E. 5 miles from Gravelines lighthouse, and E. by S. ½ S. 5⅔ miles from the Dyck light-vessel, the two light-vessels in line leads into Dunkerque road. She shows a *fixed red* light from an elevation of 33 feet, which in clear weather should be seen 7 miles. Her name is painted on her sides, and the mast is surmounted by a red ball.

Buoy.—A bell buoy with reflector, painted in black and red bands, marks the west end of the Snouw shoal in about 5½ fathoms water; it bears E. by S. 4¼ miles from the Dyck light-vessel; and N.W. by W. ¾ W. 1½ miles from the Snouw light-vessel.

BRAECK BANK, a continuation of the Snouw, is joined to it by soundings of from 7 to 8 feet. It is 6 miles long in an E. by S. and W. by N. direction, beginning at nearly 2 miles from the shore on the meridian of Mardick, and ending on the meridian of the Pilot's mast erected on the shore at about a mile to the eastward of Dunkerque. Upon its highest parts, which form a flat from 200 to 600 yards wide, are only from one to 4 feet water, and there are even some dry patches on it at the lowest tides. The Braeck is steep-to, its sides rising from the bottom like a wall, and with winds from the northward the sea breaks upon it with great fury. Its south-west end has increased considerably since its highest parts have united with those of the Snouw, and this end is now nearly connected with the shallow flats joining the shore, by a sandy shoal running to the W.S.W., and forming a sort of bar across the West Pass to Dunkerque road, upon which there are from 29 to 33 feet at low water.

HILS BANK, a continuation of the Braeck, takes an easterly direction for 3 miles from the meridian of the Pilot's mast, and terminates suddenly in soundings of from 17 to 22 feet, at 2 miles from the shore, and N. by E. of Zuydcote tower which is in ruins, called also Sables or Sands tower. The highest parts of this bank form a flat from one fifth to nearly three-quarters of a mile broad, upon which the depths are from 2 to 6 feet at low water, and there are also patches lying about N.E. by E. from Dunkerque lighthouse, which dry 6 feet at the same time of tide. The south side rises precipitously from soundings of from 45 to 50 feet, and the East side from 17 to 22 feet, rendering it exceedingly dangerous to vessels turning to windward in the eastern part of Dunkerque road.

TRAEPEGEER BANK with varying depths of from one to 18 feet over it at low water, bounds Dunkerque road to the eastward, and is connected with Hils bank by soundings of from 16 to 22 feet, which form what is called the East or Zuydcoote pass. The Traepegeer joins the shore towards a high sand-hill named the Broers duyn, and extends thence along the coast to the entrance to Nieuport. Its western extreme, upon which there are from 9 to 15 feet at low water, is only 2 cables from the south-east end of the shoal flat of Hils bank, and bears N. by E. ½ E. from Zuydcoote (Sables) tower.

BANKS NORTH OF DUNKERQUE BANKS.*—The position, extent, and depth of water on the following banks north of the Dunkerque banks, are, as before stated in page 52, the result of the labours of the late Capt. W. Hewett, R.N. They are dangerous, not only on account of their shallowness, but by their lying at a distance from the shore, and directly in the route of vessels bound to the Schelde.

FAIRY BANK, a high sandy ridge, with 3¾ to 9 fathoms water on it, rises from the eastern edge of the deep-soundings channel. Its southern end in 8 fathoms lies N. by E. 18 miles from Dunkerque lighthouse and from thence the bank trends N.E. ¼ E. 10 miles, its greatest breadth not exceeding three-quarters of a mile.

There are two flats on this bank; the one near its middle is 3 miles long, and its shoalest spot of 3¾ fathoms lies N. by E. ½ E. 22 miles from Dunkerque lighthouse, and S. by E. ½ E. 25½ miles from the Galloper light-vessel. The lighthouse may be seen in clear weather from the south end of the bank, and also from the West Hinder.

A shoal, with 6 to 9 fathoms on it, lies 2 miles to the westward and parallel to the Fairy bank.

NORTH HINDER, a dangerous sand bank, situated like the Fairy on the eastern edge of the Deep-soundings channel, is 7 miles long in a N.E. by N. and S.W. by S. direction, and a half to two-thirds of a mile broad, and the general depth on it from 6 to 9 fathoms; but a narrow flat, carrying 4 and 5 fathoms, rises on its southern part, and extends 2½ miles to the southward from about the middle of the bank, and is steep-to on its eastern side. The north end of the bank lies S.E. by E. ½ E. 24½ miles from the Galloper light-vessel, and the south end N.E. by E. 8½ miles from the Fairy bank.

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* *See* Admiralty chart, Dunkerque to the Schelde, No. 1,872; scale, $m = 0\cdot5$ of an inch.

The North Hinder may be considered as an extension of the Fairy, and between these banks are three flats, two of which, with 8 to 10 fathoms on them, occupy a space 3 miles in length midway between the banks; and the third, with 9 fathoms on it, lies 2 miles to the eastward of the north end of the Fairy. The line joining the Fairy to the North Hinder may be considered as a boundary, to the eastward of which vessels ought not to go under any circumstances.

LIGHT-VESSEL.—On the eastern side of the North Hinder bank, in 20 fathoms water, in lat. 51° 36′ 40″ N., long. 2° 34′ 30″ E., is moored a light-vessel, which exhibits from her mainmast head, at an elevation of 40 feet above the sea, a *flashing* white light, showing a flash *every eight or ten seconds*, visible in clear weather at the distance of about 11 miles. A white riding light is exhibited from her fore-stay, 6 feet above the gunwale. The vessel has two masts, and is coloured red, with the words *Noord-Hinder* painted in large white letters on her sides. During the day a red ball is shown at her mainmast head, and in thick foggy weather a bell is struck every quarter of an hour, preceded and followed by strokes of a gong.

When the light-vessel is not in position, the riding light as well as the light of the vessel, will be extinguished, and red lights exhibited at the bow and stern.

Buoy.—A red buoy is also placed in 6 fathoms water N. ⅓ E. 2 miles from the light-vessel, with the word *Hinder* marked on it in white letters; and it will be prudent for vessels of large draught to keep to the northward of the buoy to avoid the shoal flat on the North Hinder; the position of this buoy cannot at all times be depended on.

WEST HINDER, a sand bank 15 miles long and about three-quarters of a mile broad. It is steep-to, and lies to the eastward of the Fairy, and to the southward of the North Hinder. From its south end in 9 fathoms, which lies N.N.E. ¼ E. 18½ miles from Dunkerque, N.W. by W. ¾ W. 4 miles from the north-east end of the East Dyck, and E. ¾ S. 5 miles from the south end of the Fairy, the bank trends N.E. ¾ E. 8½ miles, and then N.E. ¾ N. 6½ miles to its northern end, which is 1½ miles to the S.S.E. of the south extreme of the North Hinder. A flat occupies nearly the whole length of the bank, and forms a sort of continuous crest, upon which the depth is from 2¾ to 4½ fathoms.

During daylight the West Hinder may generally be discovered by the rippling of the tide over it, but it is absolutely necessary to keep the lead going when approaching this or any of the Flemish banks.

The only passage practicable for large vessels bound to Flushing and Antwerp, and intending to enter the Schelde by the Wielingen gat, is between the Out-Ruytingen, the Bergues, and the East Dyck on one side, and the Fairy and the West Hinder on the other.

LIGHT-VESSEL.—Seven cables South of the south-west end of West Hinder bank is moored a light-vessel in 17 fathoms, in lat. 51° 22′ 30″ N., long. 2° 26′ 26″ E.; she exhibits a *revolving* light, which every *half minute* shows alternately two *white* and one *red flash*, from an elevation of 40 feet, which in clear weather should be seen 12 miles.

The vessel is painted black with red streaks, having *West Hinder* in white letters on her sides, and at the mast head is a skeleton framework. From her are the following bearings; Wielingen light-vessel E. by S. ¾ S. 27 miles; the North end of the East Dyck S.E. 3¼ miles; and Berguds bank buoy S.W. by W. ½ W. 8 miles.

Buoy.—A black buoy with a staff and ball, is also placed in about 9 fathoms water, bearing N. ¼ W. a little more than half a mile from the light-vessel, and nearly midway between it and the south-western extreme of the shoal part of the bank, upon which there are but 2¾ fathoms water; it would be advisable not to go to the northward of this buoy.

EAST HINDER, a sand-bank 11 miles long in a N.E. by N. and S.W. by S. direction and a half to nearly one mile broad, lies to the eastward of the West and the North Hinder and parallel to them; it has three flats on it, which occupy nearly its whole extent, and carry from 3½ to 5 fathoms water. The bank is steep-to on both sides, and is separated from the North Hinder by a channel 3 miles wide, with 15 to 19 fathoms in it. The north end of the bank, in 9 fathoms, lies S.E. ¼ S. 4 miles from the north extreme of the North Hinder; and the south end, N.E. ¾ N. 9 miles from the north extreme of the East Dyck.

About midway between the south end of the East Hinder and the East Dyck there is a narrow shoal 4¼ miles long, with only 5 to 8 fathoms on it; it lies 1¾ miles to the eastward of the West Hinder, and its south extreme is 2 miles to the northward of the northern termination of the East Dyck.

BLIGH BANK, composed also of sand, is 10 miles long, from half to a mile broad, and lies 3 miles to the eastward and nearly parallel to the East Hinder. Its northern end, upon which there are 8 fathoms, is in lat. 51° 41½′ N., long. 2° 48′ 9″ E., and lies N.W. ⅓ W. 26 miles from West Kapelle lighthouse, and S.E. by E. ⅜ E. 33 miles from the Galloper light-vessel; its southern end, in 5 fathoms, lies E. by N. 5 miles from the south extreme of the East Hinder, and N.E. ½ E. 13 miles from the north end of the East Dyck.

This bank is also steep-to, and has irregular depths of from 4¾ to 9 fathoms on it. A flat, 1½ miles long, rises abruptly from soundings of from 14 to 18 fathoms at about 3 miles from its southern end. There are 4¾ fathoms on the flat, and there is a patch with 5 fathoms on it, near the north end of the bank.

Another patch, with 9 fathoms on it, lies 1½ miles to the northward of

Bligh bank, and the soundings for the distance of 25 miles to the N.N.E. and N.E. by N. are very irregular, in some places only 13 and 14 fathoms; whence it follows, that the lead will be an uncertain guide when approaching the North Hinder, the East Hinder, or the Bligh bank, from the north-eastward.

THORNTON RIDGE, composed of sand, is exceedingly dangerous. It is 13 miles long East and West, with a mean breadth of 1¼ miles, and rises from soundings of from 12 to 17 fathoms at 15 miles from the coast of Belgium, and out of sight of Dunkerque, Ostende, and West Kapelle lights. A flat, 2¾ miles long and half a mile wide, with 2 to 3 fathoms on it, lies towards the eastern end of the ridge; the shoalest spot of 2 fathoms lying N.N.E. ¼ E. 19 miles from Ostende lighthouse. The general depth on the other parts of the ridge is from 6 to 9 fathoms. The land in the neighbourhood of West Kapelle may occasionally be seen from this ridge in clear weather.

The west end of the ridge lies S.S.E. 3 miles from the south extreme of Bligh bank, and the space separating them is the least dangerous channel that large vessels can take, if they intend passing amongst the banks, when bound to the northward with S.W. winds from Dunkerque.

Nearly midway between Bligh bank and Thornton ridge are three narrow shoals, occupying a space of 9 miles in an E.N.E. and W.S.W. direction, and carrying from 8 to 9 fathoms water. The western shoal lies E. ½ S. 3¾ miles from the flat on Bligh bank, and N.W. ¾ N. 5¼ miles from the shoalest spot on Thornton ridge.

A succession of shoals with 6 to 9 fathoms on them, also lie between the Thornton ridge and Out-Ratel, within sight of Ostende light. They occupy a space 10 miles long in an east and west direction, and the shoalest spot on them, 5½ fathoms, lies N. by E. ½ E., 11 miles from Ostende lighthouse; but none of them are dangerous, and they have only been described here, as they may be crossed by vessels coming out of the Zuydcoote pass, and they will then serve as a guide to assure them that they are in a good track.

ASPECT of COAST.—The sand-hills composing the coast between Calais and Gravelines may be seen in clear weather at 8 or 9 miles. but some of them are so low and unstable that embankments are thrown up to protect the land from the invasion of the sea. The only objects that will be recognised on the level land adjoining the shore are, the two windmills at Walde, the spire of Oye church, and the two windmills standing near Oye village.

At low water the sandy beach extends more than a mile from the shore between Calais and the meridian of Walde windmills, as well as off the entrance to Gravelines; along the intermediate coast its breadth varies from half to three-quarters of a mile. The depths adjoining the beach, that are less than 4 fathoms, extend 2 miles from the shore N.N.E. of Calais church, and abreast Gravelines, and about a mile from the shore between the windmills of Walde and Oye; between the outer edge of these soundings and high water mark, the slope of the bottom being rapid and irregular, causes a heavy sea to roll in when the wind blows upon the shore.*

LIGHT.—Walde iron beacon 59 feet high, on the extreme edge of the beach, at a mile from the coast at Walde point, and E. by N. ½ N. about 3¼ miles from Calais lighthouse, exhibits a light, varied alternately every *twenty seconds* by a *red* and *bright flash.* The light is elevated 34½ feet above the level of the highest tides, and in clear weather is visible at 10 miles.

This beacon is a useful guide when the beach is covered, but it is left dry at low water ordinary springs.

CAUTION.—Shipwrecks are frequent between Calais and Gravelines, and they usually occur during long winter nights, or in dark rainy weather and strong westerly winds; they are, however, in a great measure attributable to neglect of the lead, and not paying sufficient attention to the change of stream, which is much later at the Galloper light vessel, from whence vessels usually take their departure, than on the French coast.

GRAVELINES.—The entrance to this small tidal harbour for fishing and coasting craft, lies 10 miles to the eastward of Calais, and its position may be easily recognized by the houses of the village of Fort Phillippe, built close to the sea on each side the entrance channel, also by a windmill standing about a quarter of a mile to the eastward of the village, and by the fine tower of the lighthouse. The principal articles of trade are wine, brandy, gin, salt, timber, salt fish, refined sugar, beer, &c. Vessels are fitted out for the herring, cod, and mackerel fisheries. The population in 1871 was 7,733 inhabitants.

This harbour is only acessible to vessels of 14 feet draught at the utmost at high water springs. At weak springs those of 11 feet can enter it during 5 or 6 days, that is, 2 or 3 days before full and change, and 3 days after. It affords good shelter at the springs to vessels of about 12 feet draught during gales from the westward, and especially those between W.S.W. and W.N.W., when the sea is not heavy at the entrance; but the bar should be crossed at the time of high water. In a gale from E.N.E. to East they should run in with the flood, for after high water there will be some difficulty in stemming the ebb. The tide rises much higher with strong northerly winds, but as the sea is then high at the entrance, no vessel drawing more than 12 feet should attempt to enter, unless she is embayed, and there is an impossibility of reaching the anchorage in Dunkerque road, which is the only place on this coast where, with those winds, a vessel could find a little shelter.

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* The telegraph cable between France and Denmark, which goes from Calais to Fanö island, is immersed near the Huttes d'Oye, in latitude 50° 59′ 40″ N., longitude 2° 1′ 39″ E., and lies in the direction of N. 6° E. as far as latitude 51° 7′ 10″ N. and longitude 1° 59′ 39″ E., at which point it takes the direction of N. 38° E.

The first of these two directions is indicated by two beacons, each surmounted with a hexagonal prism, partly white and partly red. Vessels should not anchor in the direction indicated above.

The channel leading into the harbour runs S. by E. ½ E. 2 miles in a direct line from the entrance, and consists of two distinct parts, one bounded by the beach, and the other by the land between the village of Fort Phillippe and Gravelines. The outer part of the channel, rather more than three-quarters of a mile long and 305 feet wide at the entrance, is enclosed between two low stone jetties, which, for half their length from the shore, are not covered during the neaps. The extremity of the east jetty is marked by a large wooden beacon surmounted by a wooden lantern and weather-cock. The jetty is 2,952 feet in length, of which 1,312 feet is wood and 1,640 feet stone; the wooden portion is 8¼ feet above high water mark; the end of the west jetty is 18 feet above the lowest tides, and is marked by a large wooden beacon carrying a weathercock; this jetty is to be raised similar to the east jetty.

Both jetties have beacons on their whole length secured by strong woodwork, by means of which vessels warp in. Abreast the extremity of the east jetty, the level of the fresh water which runs out of the harbour when the tide is out, is 3 feet above the level of the lowest tides. The inner part of the channel between the village of Fort Phillippe and the harbour is little better than a mile long, and 300 feet broad, and is enclosed between two embankments, which serve for towing paths. The mud deposited in the channel forms a steep slope on either side.

The Harbour is situated on the north-west side of the town, at the mouth of the river Aa, the abundant freshes of which during rain and the melting of the snow clear both it and the entrance channel of the mud and sand which accumulate there in dry weather. It is about 450 feet long, and occupies about half the breadth of the channel by which the course of the Aa has been straightened between the ditches of the western part of the fortifications and the entrance channel. The berths of muddy sand, upon which vessels are placed alongside the stone quay bordering the whole length of the harbour on the town side, are 4¾ feet above the level of the lowest tides. The swell from outside never reaches the harbour.

Bar.—The entrance to the channel leading to the harbour is frequently obstructed by a bar formed of the sand driven by westerly winds and the sea from the beach to the westward. The height and extent of this bar depend upon the duration of these winds, as well as upon the body of fresh water out of the harbour. At its medium state it is from 2 to 3 feet above the level of the fresh water running through the channel when the tide is out, or 5 or 6 feet above the level of the lowest tides. It sometimes disappears for several days during the great freshets of the river Aa, when there is a strong N.E. wind.

PILOTS cannot get out to vessels when the sea is high on the bar, but they wave a flag in the direction they should steer.

A *red* flag is hoisted on a staff erected on the shore at the end of the west jetty during the time the entrance is practicable, and kept up as long as there is sufficient water for the fishing vessels.

A small steam-tug belongs to the port, to assist vessels if in need.

Lifeboat.—Gravelines is a lifeboat station.

LIGHTS.—Gravelines lighthouse, of a light red colour and resembling a Doric column, stands at the eastern side of the entrance, in the west part of the village of Little Fort Phillippe, at 175 yards from the shore, and 65 yards from the eastern bank of the entrance channel. It exhibits, at 95 feet above high water, a *fixed* white light, of the third order, visible in clear weather at 14 miles.

Two *fixed* white tide lights, 196 feet apart, and each 20 feet above water, are shown on the shore at the village of Great Fort Phillippe, at the end of the west jetty, from 2 hours before till 2 hours after high water, and when in line they point out the direction of the entrance. Both lights are of the fourth order, and may be seen at 6 miles.

A *green* light is shown from the extremity of the east jetty during tide time.

Beacons.—At 3½ miles E. ½ S. from the entrance to Gravelines, and at one-third of a mile off Gravelines point on the dry edge of the off-lying sand-bank, there is a beacon, and another on the shore about 1½ miles to the eastward; these two beacons in line lead up in the fairway to the anchorage off the port.

DIRECTIONS.—Vessels arriving off Gravelines harbour some time before the tide serves to enter, may anchor north of Oye church spire at 1½ or 2 miles from the shore, in from 5 to 8 fathoms, over excellent holding ground. This anchorage, however, is only safe for a few hours during fine weather, for the sea is heavy when the wind blows upon the shore.

The most favourable winds for entering the harbour are those from N.N.W. round north to N.E., but when they blow fresh they cause a high sea at the entrance, and it will then be necessary to be quite certain there is sufficient water over the bar without danger of striking. With fresh winds from W.S.W. to W.N.W. the sea is smooth on the bar, but there is then a difficulty in getting through the entrance channel when the low jetties are covered, for the flood stream may drift a vessel upon the east jetty. The entrance is easy with N.E. winds, when they are sufficiently strong to stem the flood, which is at its greatest strength when it is high water in the harbour. With a head wind, a vessel is tracked in and placed on the ground in the inner part of the channel.

The best time for entering the harbour is about an hour before high water; but, as the stream at that time runs strong across the entrance, there will be some difficulty in keeping in the deepest parts of the channel; if the vessel, however, takes the ground she may float again before the tide has done rising. The bowers and a stern anchor must be ready to let go, and hawsers to run out should she be drifted upon the east jetty. Sufficient sail should also be carried to ensure good steerage, especially during the autumn and winter months, when it may blow fresh in the offing whilst the breeze is light near the shore, which circumstance would place a vessel in considerable danger in the great swell on the bar. In entering the channel with westerly winds, whatever may be their strength, and also with light easterly winds, pass close to the northward of the outer West beacon; with fresh easterly winds pass either close to the northward of the outer East beacon, or run directly for the middle of the entrance.

TIDES. It is high water, full and change, in Gravelines harbour at 12 o'clock, and the tide rises (above the level of the fresh water which runs out of the harbour when the tide is out, and which is about 3 feet above the level of the lowest tides) 18 to 19 feet at ordinary springs, 20 feet at great springs, and 12 to 15 feet at ordinary neaps. By deducting 2 feet from these heights, the rise of water on the bar, supposing it to be in its medium state, will be found. Strong winds from N.W. to N.N.W. cause the tide to rise higher, and thoes from S.E. have a contrary effect.

The tide rises slowly for the first three hours, but its rise is rapid from the third to the fourth hour; it then slacks gradually till high water. At springs the high-water slack in the harbour continues about 15 minutes in calm weather, 20 to 30 minutes with westerly winds, and 10 minutes at the utmost with off-shore winds; but as there is little rise or fall for the last half hour flood and the first half hour ebb, there is a period of nearly 1½ hours for moving vessels in and out without danger and grounding.

The French system of tidal signals is used at this port (*see* page 81).

ASPECT of COAST.—The low plain behind the shore between Gravelines and Dunkerque presents no remarkable objects visible at sea; the only high land that can be seen in clear weather are two isolated hills named Great and Little Cassel, rising S. ½ W. from Dunkerque. The town of Cassel stands on the summit of the largest, and the other hill is in the form of a cone. The buildings that may be recognized on the coast are, the tower and lighthouse at Dunkerque, and the church towers of Grande and Petite Synthe and Mardick. Gravelines point, bearing E. ½ N. 3½ miles from Gravelines lighthouse, is of a rounded form, and the sand-hills composing it lie in several parallel ridges, and are visible in clear weather at 9 or 10 miles. A chain of sand-hills covered with verdure extends 2 miles in a W.S.W. direction from the point.

The sand-hills bordering the shore for about 2 miles to the eastward of Gravelines point are about the same height as those at the point, but beyond this, and to within a short distance of Dunkerque, they are covered with bent grass, and lie in parallel ridges at half a mile in the rear of an embankment, fronted by low land, which is covered at spring tides.

Between the entrance of Gravelines and Gravelines point the beach dries out half a mile at the springs; abreast the point it dries 3 cables, and between the point and Dunkerque to the distance of 6 or 7 cables, The sand which is carried to the eastward by strong westerly winds is arrested by the jetties at Dunkerque, and accumulates on the beach between Mardick and Dunkerque, where it forms an immense heap, the highest parts of which are barely covered at the springs. Of all the obstacles which oppose themselves to the improvement of Dunkerque, this high beach is the most difficult to overcome, for the sand from it is forced over the west jetty, and forms a bank several feet high at the end of the jetty and across the entrance.

The soundings off this part of the coast, within the depth of 5 fathoms, are very irregular, and the sea is heavy with northerly winds. Between the entrance to Gravelines and Gravelines point these soundings extend 2 miles from the shore, and amongst them lies a deep, named Fosse de Mardick, which, although carrying from 26 to 29 feet water, should always be avoided. This deep is separated from the West pass leading to Dunkerque road, by the eastern end of a shoal, with 11 to19 feet over it, which extends to the westward as far as the meridian of Gravelines lighthouse. Another shoal, the edge of which is steep-to, joins the beach between Mardick and Dunkerque, and extending 1½ miles from the shore forms the southern boundary of the West pass; its western end lies N.W. by N. of Mardick church tower.

Off Gravelines point at the edge of the low-water is a beacon, and there is another, a little within the high-water, about 1½ miles eastward of the point.

The WEST PASS, or Passe de l'Ouest, into Dunkerque road, is about 4 miles long, and lies between the shoal flats joining the shore and the Snouw bank. The entrance to it, as well as the direction it follows, is marked by the following buoys:—

A striped red and black buoy, with bell and reflector, is moored at the western extremity of the Snouw at the entrance of the pass, and must be left on the port hand in entering (*see* page 59).

The northern edge of the pass, as well as the most dangerous parts of the steep edge of the Braeck bank, are marked by the following three black buoys with staffs, which must also be left on the port hand in entering.

Black buoy No. 1 is moored on the southern edge of the steep high flat of the Snouw, nearly 1¼ miles E. ¼ N. of the Snouw light-vessel.

Black buoy No. 3 is moored 1½ miles farther to the eastward, on the western edge of the Braeck bank; but a narrow part of this bank, with 17 to 19 feet water on it, extends nearly 1¼ miles to the westward of the buoy, and is dangerous to vessels of large draught running into Dunkerque road with a strong westerly wind at low water.

Black buoy No. 5 is moored in 20 feet water upon the southern edge of the Braeck bank, about a mile to the eastward of black buoy No. 3.

The southern edge of the West pass, as well as the southern limit of the western part of Dunkerque road, are marked by four red buoys moored upon the outer edge of the dangerous flats joining the shore as follows:—

Red buoy No. 2 marks the north-west edge of the bank, and lies 1¼ miles S.E. by E. of Snouw light-vessel. It is necessary to see this buoy either when entering or leaving the pass. A pilot vessel generally lies at anchor near it.

Red buoy No. 4 lies on the edge of the 16 feet soundings joining the beach, about one mile E. by S. from red buoy No. 2, and S.W. three-fourths of a mile from black buoy No. 3.

Red buoy No. 6 lies about 1¾ miles to the eastward of red buoy No. 4, upon the edge of the same 16 feet soundings, N.E. by E. ¼ E. from Mardick church tower, and S. ¾ W. three-quarters of a mile from black buoy No. 5.

Red buoy No. 8, on the outer edge of the flat, lies 1¼ miles E. by S. ½ S. from No. 6 buoy, and N.W. ½ W. one mile from the entrance of the harbour.

The northern limit of the eastern part of Dunkerque road is marked by two red buoys, the eastern one having a staff and ball. The western buoy is moored on the southern edge of the Braeck bank, N. by E. ¼ E. one mile from the entrance to Dunkerque; and the eastern buoy No. 6, lies upon the southern edge of Hils bank, E. ½ S. 1¾ miles from the red buoy last mentioned.

PASSE de ZUYDCOOTE or EAST PASS into Dunkerque road, runs in a N.E. ½ E. and S.W. ½ W. direction between Hils and

Traepegeer banks, and carries 17 to 22 feet at low water; its limits are marked by one black and two red buoys. The southern red buoy with staff and ball, No. 4, marks the south-east edge of Hils bank; the northern red buoy, with staff and ball No. 2, the north-east edge; and the black buoy No. 1, the north-west edge of the Trapegeer.

Caution.—The red buoys upon the eastern slope of Hils bank, which is very steep, sometimes drift and cross the Zuydcoote pass to the western slope of the Traepeeger; this frequently happens to red buoy No. 4.

DIRECTIONS.—Vessels running for Dunkerque road, either by the West or by the Zuydcoote pass, must leave all buoys and beacons painted red to starboard, and all painted black to port. When the flood stream begins to be felt in the road, which is about the time of half flood in the harbour, the tide has risen 9 feet in the Zuydcoote pass, and the largest vessels that can enter Dunkerque may at any time pass over the south-west end of the Traepegeer by keeping the spires of Bergues church open about a degree to the westward off Leffrinckoucke church tower bearing about S.W. by S. ¼ S.

If a vessel's draught will permit her to turn through the Zuydcoote pass between half flood and half ebb, the lead must be hove quickly to avoid coming suddenly upon Hils bank; and in standing to the eastward the spires of Bergues should not be opened more than two degrees to the eastward of Leffrinckoucke church tower. In thick weather, should the spires not be visible, she may run through this pass, if Sables tower is seen, by steering for it on a S. by W. ½ W. bearing.

Vessels leaving Dunkerque road by the Zuydcoote pass will cross the western part of Nieuport road, where there is excellent holding ground, with from 5 to 9 fathoms water. The Smal bank, which bounds this road to the northward, is extremely steep and dangerous N. by E. ¾ E. of Sables tower, and as it lies only half a mile from the red buoy No. 2 on the north-east edge of Hils bank, it will be necessary, when out of the pass and the water deepens to 7 fathoms, to steer E. ¾ N.

At Night, vessels of less than 10 feet draught wishing to enter Dunkerque road by the Zuydcoote pass, and unable to distinguish the colour of the first buoy they obtain sight of, cannot do wrong by steering close to the eastward of it, for there is sufficient water for them as far as 4 cables to the eastward of black buoy No. 1 on the north-west edge of the Traepegeer; and if it is the red buoy No. 2 on the north-east edge of Hils bank, they will by steering to the eastward of it be in the middle of the pass (*see* page 86).

DUNKERQUE ROAD, being narrow, and only sheltered by banks always covered, must only be considered as a temporary anchorage for vessels waiting to enter the harbour; it might, however in a case of necessity, afford shelter to ships of the greatest draught. Sharp vessels deeply laden will be in some danger from the heavy sea, but with this exception the pilots consider that with good ground tackling a vessel might ride out a northerly gale.

The road is comprised between the outer edge of the 5 fathoms soundings joining the shore, and the Braeck, Hils, and Traepegeer banks It extends from the western end of the shallow flat on the Braeck, N.E. of Mardick tower, to the entrance of the Zuydcoote pass, and is separated into two deeps by a sandy bottom 3 cables wide, the centre of which lies N.N.W. ½ W. from Dunkerque lighthouse. There are 5 to 8 fathoms on this sandy bottom; but the holding ground is bad in the deepest water.

The western of these deeps or the Great road, in which the soundings are from 7 to 9 fathoms, good holding ground, commences N.E. of Mardick tower, and is in some degree sheltered from the high sea during northerly gales by the high flat on the Braeck bank. It is in this part of the road that vessels of large draught anchor with westerly winds and a heavy sea, when they have to wait several hours for high water to enter Dunkerque. Smaller vessels under similar circumstances can anchor N.W. about a mile from the entrance of the harbour on the southern part of a sandy bottom, as the holding ground there is good and the depths from 5 to 7 fathoms; this is also a good position for all vessels with off-shore winds.

The eastern deep or Little road commences with Heuguenar tower in line with Dunkerque lighthouse, and extends to the Zuydcoote pass; the depths in it vary from 8 to 11 fathoms, and the holding ground is good, particularly N.N.E. of Dunkerque. Large vessels requiring to remain some time in Dunkerque road, should anchor in this deep between the lines on which Heuguenar tower is seen touching the eastern side of the lighthouse, and the same tower in line with Dunkerque tower, where they will be better sheltered than in the western deep, against the heavy sea during gales from N.N.W., round northerly to E.N.E. by the high flats on Braeck and Hils bank; and in the event of their parting it will be much less dangerous for them to run ashore to the eastward than to the westward of Dunkerque. A vessel at anchor in any part of the road should have a spare anchor ready to let go as soon as the wind veers and threatens to blow from the northward.

TIDES.—It is high water full and change at Dunkerque at 11h. 55m. *See* page 79. The first of the flood stream in Dunkerque road comes from the N.N.W.; as it gains strength its direction is more to the eastward, and at its greatest speed, which lasts about 2 hours, it runs straight through the road. It then decreases rapidly, and after a few minutes slack water the ebb stream commences, which runs first to the N.N.W., and as its rate increases it turns to the westward; at its greatest strength it runs parallel with the coast, and towards the end of the tide its direction is W.S.W. and S.S.W.

DUNKERQUE, situated 10 miles to the eastward of Gravelines, is both a naval and commercial port, and the principal French port in the North sea. The town stands at the junction of the Bergues, Bourbourg, and Furnes canals, and the public buildings are spacious, handsome, and regular; as this point serves as an outlet for the great manufacturing Département du Nord, the trade by sea is considerable, and the cod and herring fisheries are carried on with great activity. The population in 1872 amounted to nearly 35,000.

The principal articles imported are flour, cotton, wool, gin, flax, machinery, sugar, salt, oleaginous seeds, coal, pig iron, lead, iron, timber, potash, sulphur, vegetable oils, and tallow; and the total amount of customs revenue was, in 1869, 107,038*l*. In the same year, 2,723 vessels of 429,456 tons entered, and 2,695 vessels of 424,805 left the port. In 1871 the Iceland cod fishery employed 111 vessels amounting to 11,000 tons, belonging to Dunkerque, manned by 1,738 officers and men; and the coast fishery employed 78 vessels amounting to 2,341 tons manned by 545 men.

At the upper end of the outer harbour there are several yards where fishing vessels of 30 to 150 tons, and vessels of 600 to 800 tons, are built for the coasting trade and long voyages. There is a gridiron for careening small vessels, but vessels of more than 400 or 500 tons must go to Havre or England for repairs. At present there is no patent slip.

There is a steam service between Dunkerque, London, Hull, Rotterdam, Saint Petersburgh, Havre, Bordeaux, and Marseilles.

The port consists of an entrance channel leading to an outer tidal harbour, at the end of which is an inner tidal harbour and a floating basin. The inner harbour, together with the floating basin and the buildings around it, belong to the Government, and form what is called the Naval Arsenal.

Vessels drawing 19 feet can enter the port at high water, during three or four days after full and change, and advance as far the eastern jetty, where they can be lightened; if drawing 18 feet, they can proceed as far as the first stone quays, where the cargo can be discharged; and if of 17 feet draught, they can enter the floating basin. During three or four days after each quarter, about 4 feet must be deducted from the above depths. When the extensive works now in progress are finished, there will be an augmentation of 3 feet to all the depths above mentioned. At low water there are only 3 feet at springs and 6 feet at neaps in the entrance channel.

Considered as a place of shelter, the port will admit vessels of about 16 or 17 feet draught at high water ordinary springs, during strong winds between N.W. and W.S.W.; 18 feet at great springs; and 12 feet at neaps. Northerly gales cause such a high sea outside the jetties that those of above 14 feet draught should not attempt to run in at that time without the pilots judge the entrance practicable; small vessels may enter at the top of high water by carrying all possible sail to get through the high sea, but the entrance is inaccessible during these gales at the neaps to all except coasters.

The entrance channel, which is about a mile long in a N.N.W. and S.S.E. direction, and 230 feet wide, is enclosed partly by the citadel quay and the extension of the town quay as far as the Cunette sluice, and partly between wooden jetties. The sand forces itself into the channel by the openings between the pilework and through the entrance, particularly during dry weather and at the neaps. A portion of water from the canals in the interior, as well as that from the ditches of the town, is used to scour out the harbour and the entrance channel, but although the stream is rapid, it has such a distance to run that its effect does not extend far beyond the jetty heads. During the rainy season, and at the melting of the snow, when the water in the interior is abundant, the stream runs strong out of the channel all the time the flood is weak, and is checked only when the tide rises rapidly, but it recovers its course as soon as the tide slacks, which is about half an hour before high water, and as soon as the ebb makes it acquires great speed. This stream is but little inconvenience to vessels of large draught entering before high water, but as soon as the tide begins to fall they must have a strong fair wind to get through.

The entrance channel dries only within 2 cables of the outer harbour; outside this the depths in the channel vary from one to eight feet in the furrows formed by the scouring water. From the Cunette sluice to the harbour, both sides of the channel are bordered by slopes of soft mud, upon which vessels are placed that cannot find room in the harbour, or those which come to refit and can bear to lie aground. Neuf quay between the sluice and the Belvéder rampart, is especially allotted to steam vessels, and the berths of mud upon which they lie are 2 or 3 feet above the level of low water great springs. The berths along the stockade opposite the quay are about the same height, and are also of soft mud. Vessels lying in this channel should be securely moored, for a strong northerly wind sends a swell in. With westerly winds those of about 15 feet draught lie aground on these berths for 5 or 6 days, but with easterly winds they only remain a day or two at the utmost.

The outer harbour occupies the space between the town and the citadel, and is about 3 cables long, from 400 to 500 feet wide, and entirely surrounded with quays. It dries out at the springs, and the bottom for the most part is a mixture of sand, shingle, and mud; towards the middle of the harbour it is covered with black mud, broken tiles and bricks.

Vessels lying alongside the quays ground upon a hard bottom, which at the foot of the citadel quay, on the north-west side of the harbour, is 3 to 4 feet above the level of the lowest tides; at the foot of the Dutch and Holland quays it is obstructed by the ruins of old walls and piles covered with mud. When it blows strong from the northward the swell enters the harbour for about 2 or 3 hours each tide, but it does not inconvenience a vessel if she is well secured.

The inner harbour, which communicates directly with the outer harbour and dries out every tide, is nearly bordered throughout by an earth embankment. On its south side are three large building docks, and on its north side is the right wing of the storehouses surrounding the floating basin.

The floating basin, called also the Naval basin, occupies a space of 32,820 square yards, and communicates with the outer harbour by a wide flood gate, the sleepers of which are on a level with low water great springs. All vessels that can enter the harbour can enter the basin, but those of large draught are obliged to wait for nearly the top of high water to go over a ridge of hard clay in front of the gate, 4 or 5 feet higher than the sleepers.

LIGHTS.—A handsome yellow brick tower, 177 feet high, in form of a tall column, is erected on the shore between the west jetty and the ruins of Risban fort. It stands S. by E. ½ E. 875 yards from the extremity of the west jetty, and exhibits, at 193 feet above high water, a *revolving* white light, of the first order, the *eclipses* of which succeed each other *every minute.* The bright intervals are visible in clear weather a distance of 25 miles; in ordinary weather the eclipses do not appear total within the distance of 12 miles, a faint light being seen between the bright intervals.

A *fixed red* light, of the fourth order, elevated 23 feet above high water, and visible at 3 to 4 miles, is shown at the extremity of the west jetty, from whence a bell is sounded in foggy weather.

A *fixed green* light is shown from an iron post at the head of the east pier, visible 3 miles.

A *fixed* white light, of the fourth order, and elevated 85 feet above high water, is exhibited from the Heuguenar tower S. by E. ½ E. 2,406 yards from the entrance between the jetty heads. It is especially intended as a guide for the entrance channel, and shows a bright ray in that direction, or N. by W. ½ W., visible 10 miles. To the right and to the left of this direction the light will not be seen in ordinary weather, to the distance of 5 or 6 miles, but in an angular space of 10° or 12°.

PILOTS.—The Dunkerque pilots are unable to get out of the harbour when there is a heavy sea at the entrance, which is frequently the case; but nine of them in their turn remain out during ten days in a large decked vessel, sloop-rigged. This vessel is generally at anchor in the West pass near red buoy No. 2; she is not permitted to run into port except during gales, and is provided with anchors and cables to assist vessels in distress. The pilots always go out of the pass to meet large vessels; small vessels requiring one should make a signal as soon as they arrive in sight of the pilot vessel.

There are steam tugs belonging to the port to assist vessels if required.

Lifeboat.—Dunkerque is a lifeboat station.

DIRECTIONS.—When bound to Dunkerque from the westward with the wind between N.N.W. round westerly, and S.S.W., endeavour to make the land about cape Gris-nez, and taking a departure from about 2 miles to the westward of that cape, steer N.E. by E. ¾ E. 12 miles, or until the western windmill at Coquelles bears S. ½ W. or mont Couple S.W. by S. From thence, the course to the Snouw light-vessel is E. by S., and the distance about 17 miles, this passes close to the red perch buoy on the north-east extreme of Le Riden de Calais, and about one-third of a mile to the southward of the Dyck light-vessel; or by continuing on the same N.E. by E. ¾ E. course towards the large chequered buoy of the west extreme of the Out Ruytingen, for 2½ or 3 miles, you will come on the line of the Dyck light-vessel and Dunkerque yellow tower lighthouse, upon which steer, the course being E. by S. ¾ S.

If approaching from the north, Gravelines lighthouse open westward of Dyck light-vessel S. by E. ½ E. will lead up in the deep between the east and west Out Ruytingen banks, but over the West Dyck in from 3½ to 4 fathoms at low water. From the Dyck light-vessel, the course up to Dunkerque road, passed the Snouw light-vessel, is E. by S. ½ S., about 9 to 11 miles.

When to the eastward of Gravelines, and marks cannot be seen, the lead must be hove quickly, so as not to go into a less depth than 5 fathoms.

In entering the West pass, run to the southward of the striped red and black bell buoy and Snouw light-vessel, and then between the three black buoys which mark the northern, and the red buoys which mark the southern side of the pass. Vessels of large draught running in with a strong westerly wind at low water should, in order to avoid the narrow spit with 17 to 19 feet on it, which extends 1¼ miles to the westward of black buoy No. 3, keep about 3 cables to the northward of the red buoy No. 2, on the southern side of the pass. Large vessels, having to wait for high water to enter Dunkerque, anchor between the meridian of black buoy No. 5 and that of Petite Synthe church.

At Night, if the wind is in the same direction, after running the above course N.E. by E. ¾ E. 12 miles from cape Gris-nez, or until Calais light bears S.S.E. ½ E. and cape Gris-nez light S.W. by W., steer E. ¾ S. up to the Dyck light-vessel, when in ordinary weather a vessel may anchor to await daylight; if it is not advisable to anchor, short boards should be made in from 9 to 10 fathoms between the West Dyck and the land, within the limits where Calais light bears S.W. ¾ W. and Gravelines light S.S.E. ¼ E.: or, she should then bring the Snouw light-vessel to bear E. by S. ½ S. and steer for her, and after passing close to the southward of her, keep on the same course with the two light-vessels in line, through Dunkerque road, and anchor in about 8 fathoms with Heuguenar tower light between the two jetty lights S.S.E.

With the wind between N.N.E. and E.N.E. long boards should be made in the Pas de Calais, until the town of Calais bears S.S.E. ½ E., when a vessel may stand in for the land, keeping the lead quickly going to avoid crossing the Riden de Calais. Boards of about 3 miles long can be made between the West Dyck and the edge of the 5 fathoms soundings, which borders the shore, but from the meridian of Gravelines lighthouse, up to the entrance of the West pass, short tacks should be made near the edge of these soundings, bearings of the Dyck and Snouw light-vessels enabling it to be done with great confidence.

From the Northward.—When bound from the North sea to Dunkerque, or to the other French ports on this coast, endeavour to make the land about cape Blanc-nez, whatever may be the direction of the wind or the time of tide. The land to the south-west of this cape, as far as cape Gris-nez, may be seen in ordinary weather at about 18 miles, and mont Couple and the hills around it at 22 or 23 miles. The course, with easterly winds, from a position about 3 or 4 miles to the eastward of the Galloper light-vessel is S.S.W. ¾ W.; this will lead to the eastward of the Four-mile knolls or North Falls head, and when the North Foreland lighthouse bears W. by N. ¾ N. steer S. W. ¼ S. to pass midway between the North Falls tail and the south-west end of the Sandettié bank. In clear weather there is no difficulty in turning to windward over this ground, but when the weather is foggy or thick the lead must be kept quickly hove, so as not to come into a less depth than 20 fathoms.

At night the lights at the South Foreland, cape Gris-nez, Calais, and even Dunkerque, may be seen in clear weather when a vessel is midway between the North Falls tail and the south-west end of the Sandettié, and from this position, if the wind be from the eastward, Calais light may be steered for; or, if from the westward, the land between Calais and cape Gris-nez; but to keep a safe distance from the coast, it will be necessary in the former case not to bring cape Gris-nez light to the westward of S.W. by W. ¼ W., or Gravelines light to the eastward of S.E. by E. ¼ E., unless bound to Calais; and in the latter case not to bring cape Gris-nez light to the westward of S.W. ¾ W., or Calais light to the eastward of

S.E. by S. With strong northerly winds, it would not be prudent to approach within 5 miles of the coast, not bringing Gravelines light to the eastward of S.E. by E.

With strong westerly winds vessels sometimes keep to the westward of the Galloper and the Falls, to get smoother water. They pass either to the northward of the Galloper bank, or between that bank and the Four-mile knolls. The course from a position 2 miles westward of the Galloper is S.W. by S., and after running about 35 miles in that direction the vessel will be 5 or 6 miles to the southward of the North Falls tail, and cape Gris-nez light, if the weather be clear, will be in sight.

Entering Dunkerque have good hawsers ready to moor head and stern, the anchors clear, and with a fair wind a heavy anchor to bring up by the stern. All possible sail should be carried to pass quickly through the breakers on the edge of the beach. Fresh northerly winds raise a heavy sea at the entrance, and the best time then for running in is at high water. When within the entrance channel there will be no difficulty in reaching the harbour.

Winds between N.W., round westerly, and S.S.W., when strong, cause a heavy swell at the entrance. At this time keep close to the west jetty head and the western side of the channel until sheltered by that part of the jetty which is boarded up, as the flood stream crosses the open pile-work, and runs with great rapidity upon the east jetty. This stream is at its greatest strength about half an hour before high water in the harbour. The most favourable time to enter, with moderate westerly winds, if a vessel's draught will permit, is when the stream slackens, or about half or three quarters of an hour after high water in the harbour.

Strong easterly winds also raise a high sea at the entrance on a weather tide; with these winds steer for the east jetty head, and then run along the eastern side of the channel. The entrance is not accessible to sailing vessels when it blows strong between S.S.W. and S.S.E., but the sea is then smooth in the road, and they can remain there without danger. During calms or light winds every effort should be made to close the west jetty head to avoid being drifted to the eastward of the entrance by the flood stream, which runs at its greatest strength outside the jetties the whole time that large vessels can enter. The best time for those of light draught to run in is, directly the signal is made that there is sufficient water, before the flood has attained its greatest strength.

Leaving Dunkerque.—Sailing vessels bound to the westward or to the ports in the northern part of the North sea generally wait for favourable winds and spring tides to quit the harbour. The gates of the floating basin are opened one hour before and closed about half an hour after high water. Winds with southing in them are the most favourable for leaving, but those that blow upon the coast, when they are strong, forbid any egress.

If bound to the westward, the harbour should be left directly they float, if the wind is sufficiently strong to stem the flood stream; but with a light wind they should not start until near the top of high water, and then anchor in the road for the stream to slacken. On quitting the West pass steer for Dyck light-vessel, and thence a W. by N. northerly course will lead to the northward of the Riden de Calais, and when Calais lighthouse bears S.E. ¾ S., or cape Gris-nez lighthouse S.W. ¾ W. a S.W. by W. ¾ W. course will lead a safe distance to the westward of that cape.

If bound to the northward, and the vessel's draught will permit her to cross the banks northward of Dunkerque, the entrance channel should be left as early as possible before high water; but this passage should never be attempted without a fresh fair wind to enable her to run quickly over the banks. When clear of the jetties, steer N. ¼ W. to get the spire at Petite Synthe in line with the guard-house which stands about a mile to the westward of Dunkerque lighthouse, bearing S.W. ⅜ S.; then steer N.E. ⅜ N., with this mark on, crossing in succession the Braeck, the Smal, and the East Breedt banks, until the lead shows that the vessel is near the eastern edge of East Dyck bank, when a N.E. by E. course for 35 miles will lead between Thornton ridge and Bligh bank. The soundings on this latter course will be from 14 to 19 fathoms. A cast of 9 or 10 fathoms may be had on the two narrow shoals lying between Thornton ridge and Bligh bank.

If the vessel's draught will not permit her to cross these banks, leave the harbour as soon as she floats, to benefit by the flood stream which runs in the offing 3 hours after high water at Dunkerque, and when outside the jetties steer to enter Nieuport road by the Zuydcoote pass. When clear of the pass, steer E. by N. ¾ N. through the road until Furnes is in line with a white sand-hill, flattened at the summit and free from verdure, named Broers duyn (page 79), bearing South, when the vessel will be on the narrow shoal joining the Smal bank to the Nieuport banks. From this position a N.E. ⅓ N. course for 35 miles will lead through the North channel, and clear of all the banks. The only inconvenience in following this course is crossing the stream in an oblique direction, which must be allowed for. Vessels of moderate draught at anchor in Dunkerque road may gain the open sea by following the above route, but they must endeavour to run through the Zuydcoote pass a short time before high water, and over the narrow shoal which unites the Smal bank to the Nieuport banks a short time after that period. Ostende light may be seen in ordinary weather until within 2 miles of the southern part of the Thornton ridge.

TIDES.—At Dunkerque it is high water, full and change, at 11h. 55m., springs rise 16¾ feet, neaps 13½ feet; and the tide rises (above the level of the water which remains at low tide between the jetty heads, and above the sandy ridge at 160 yards outside the west jetty head) 19 feet at ordinary springs, 21 feet at great springs, and from 13 to 16 feet at neaps. Strong northerly winds raise the tide 2 or 3 feet higher, but the sea is then heavy at the entrance. The springs, when easterly winds prevail, do not rise much higher than the neaps with fresh westerly winds. In calm weather the tide remains slack in the harbour at high water about 15 minutes; 20 or 25 minutes with westerly winds; and 10 minutes with off-shore winds. A short distance outside the jetties the flood stream runs 2¾ or 3 hours after high water in the harbour. *See* page 71.

The tidal signals used at this port are the same as those in general use on the coast of France. They are made from the flagstaff erected upon the terrace of an elegant little building, standing S.S.E. 109 yards from the lighthouse, between the west jetty and Risban fort. *See* page 81.

ASPECT of COAST.—The coast between Dunkerque and the frontier of Belgium, and beyond the frontier as far as Blankenburg, an extent of 33 miles, trends nearly in a straight line to the eastward. The shore being low and sandy, and bordered by sand-hills, has a dull uniform appearance, and the only objects that can be recognized on the level plain in the interior, are the clumps of trees surrounding the villages, the church towers, and the windmills. Between Dunkerque and the frontier, which is 7 miles to the eastward, some revenue guard-houses, and a large beacon named the Pilot's mast, may be seen on the sand-hills near the shore, and an old ruined tower amongst the sand-hills near Zuydcoote; and beyond the frontier, the towers of Furnes, the ramparts and church tower at Nieuport, and a white sand-hill N. ¼ E. from Furnes, named the Broers duyn, which is flattened at the summit and may be easily recognized at sea by its being a little more elevated than the adjacent hills, and totally free from verdure, whilst those near it are of a brown colour, being covered with bent grass.

The sandy beach bordering the coast dries out a quarter of a mile at low water, and the depths outside it increase gradually to 4½ fathoms at a mile from the shore. To ground in bad weather upon this part of the coast on a falling tide, would be less fatal than upon the beach between Dunkerque and Mardick, for whatever may be the violence of the wind and surf, if a vessel runs stem on to the beach she will make a bed in the sand, and the tide will soon leave her, especially if she takes the ground about half an hour after high water at the springs. Assistance can then be afforded to the crew, and they may be saved if they remain on board; whereas a vessel to ground upon the high beach westward of Dunkerque would become a total wreck, often with the loss of the crew, at whatever time of tide she runs ashore.

TIDES.—Upon the north coast of France, as well as upon the English shore from Dover to the North Foreland, the tide takes 5¼ hours to rise at springs from the level of low water to that of high water, and 7¼ hours to descend from that level to low water; but these durations vary according to the moon's age; that of the flood increases progressively from full and change to the following quarter, whilst that of the ebb decreases, so that two or three days after the quarter the duration of the ebb is as long as the flood; it then increases gradually until the following full and change, and that of the flood decreases. In calm weather both streams in the offing have respectively about the same duration as the rising and falling tide on the shore, and their rate is in proportion to the range of the tide. The flood stream is generally less rapid than the ebb, but the rate and duration of both are influenced by the winds.

It has not yet been ascertained by any decisive observations whether the range of the tides, at about mid-channel, between the north coast of France and the estuary of the Thames is equal to that observed on the surrounding shores. All that is positively known on the subject is, that as far as 15 or 16 miles from the French coast the vertical motion of the tides seems to follow very nearly the same law as upon the shore, they take place at the same times, and they appear to rise in an equal degree; but if the rise of water at springs on this coast, at Calais, for example, is compared with that observed at the same tides on the coasts of Holland and Belgium, as well as at several positions in the estuary of the Thames, and especially at Orfordness, it would appear that beyond the distance of 15 or 16 miles from the French coast, in a N.N.E. and E.N.E. direction, the range of tide decreases in the same manner as upon the shores. It is even probable that this decrease is very rapid, for in the middle of the North sea, between Holland and England, there are not more than 2 feet difference between high and low water; the mariner, therefore, in determining his position by the depths marked on the chart will have to diminish the allowance required for the rise of tide, according to his distance from the nearest shore.

The tides upon the coasts of France, Belgium, and Holland, as well as upon the coast of England from Dover to the North Foreland, are produced by the tidal wave, which, having traversed in about 8 hours the whole extent of the English channel, runs through Dover strait and spreads into the North sea. The flood stream, when at its greatest strength, takes an E.N.E. course, and its direction is only changed near the shore by the bends of the coast.

The tides upon the English coast to the northward of the North Foreland are produced by a similar tidal wave, which, after having doubled the British islands to the north, extends to the southward along the eastern coasts of Scotland and England, and runs directly towards the estuary of the Thames. The flood stream, when at its greatest strength, runs parallel with the English coast, but when it has reached the parallel of Orfordness, and the Thames opens out, it turns to the W.S.W., in an opposite direction to that which the flood stream follows near the coast of France. But as the changes in the tides in the offing occur later than the times of high and low water on the shore, in proportion as the positions where they take place are distant from the land, the stream of flood on the French coast is evidently mixed in the neighbourhood of the Gabbard and Galloper banks with the ebb stream which runs out of the mouth of the Thames.

CAUTION.—Mariners ought to bear in mind that the streams in the offing in the North sea are not signs to indicate the rise and fall of the tide, as they are upon the shore; for a vessel would be exposed to the greatest danger if she ran with the stream of flood towards a shoal lying far from the land, under the idea that in consequence of the direction of the stream the water was still rising upon the shoal and that she might venture to cross it. The flood stream only ceases to be felt in the vicinity of some of those banks which lie the farthest out from the coasts of France and Belgium, when it is nearly low water on the shore. When desirous of crossing a bank lying within 15 or 16 miles of the French coast, an approximate calculation should always be made of the number of feet the tide has risen above the soundings marked on the chart.

WEATHER SIGNALS.—The following local signals have been adopted at the principal ports and shipping places on the coast of France, in addition to the established storm warnings:—

1. A flag, of any colour, indicates weather doubtful, barometer inclined to fall.
2. A short pendant (cornet) indicates appearance of bad weather, heavy sea, barometer falling.
3. A pendant indicates appearance of better weather, barometer rising.
4. A ball above cornet indicates the entrance of the port has become dangerous, be careful.
5. A ball below cornet indicates the lifeboat is coming out.

TIDAL SIGNALS.—The following system of tidal signals was issued in August 1855 by the French Minister of Commerce and Public Works, and is now used at most of the ports on the coast of France. The signals are made by balls and flags hoisted on a mast, on which a yard is crossed. The balls are black.

A ball hoisted at the intersection of the mast and yard will denote a depth of 10 feet English in the channel between the jetties.

Each ball hoisted on the mast *beneath* the first will denote an additional depth of 3¼ feet.

Each ball hoisted *above* the first will denote an additional depth of 6½ feet.

Each ball hoisted at the *left* yard-arm (looking from seaward) will denote an additional 10 inches.

Each ball hoisted at the *right* yard arm will denote an additional 1 foot 8 inches.

To indicate the state of the tide a white flag with a black cross is used; also a black pendant. These are hoisted at the mast head immediately there are 6½ feet in the channel, and lowered when the water has receded to the same level. During the flood the pendant will be *above* the flag; at high water and during the top of the tide the pendant will be lowered; and during the ebb the pendant will be *below* the flag.

When the state of the sea is such as to prevent vessels entering the port a red flag is hoisted at the mast head.

The upper part of all jetty heads from half-tide upwards is painted white, with a scale of metres marked, commencing from the same level.

Danger Signals.—The following danger signals have been established on the coasts in the event of the entrance of a harbour being obstructed by a stranded vessel or any other accident, viz.:—

By day, a red flag will be hoisted on one of the jetties.

By night, a *red* light will be exhibited, and in those harbours where a light is established a second light will be exhibited, and both will show a *red* light.

Buoys and Beacons.—The following system of colouring all buoys and beacons is observed on the French coast. In entering a port, buoys and beacons painted red must be left to starboard, and those painted black to port; those painted with black and red horizontal bands may be passed on either side, and all warping buoys are painted white. Every buoy or beacon bears the name of the shoal or rock it is meant to distinguish, and also its number commencing from seaward, the even numbers on the red buoys and the odd on the black, the black and red striped buoys are named, not numbered.

CHAPTER IV.

DUNKERQUE TO THE SCHELDE.

VARIATION, 1878.

Ostende	15° 57′ W.	Flushing	15° 51′ W.

Decreasing 9′ annually.

The COAST from the boundary of France to Ostende is skirted by sand-hills of varying height, but none of so marked a character as to distinguish it from the others, and thus to serve as a guide for identifying the shore from the offing. The most useful objects for this purpose are the churches of the various towns, &c., of which the following is a running description.*

Nieuport lies 15 miles east of Dunkerque; the intermediate land is all low, with hummocks of sand along the shore, and several churches appear in the background. That off Leffrinckoucke with a spire, Zuydcoote with only a square steeple, Furnes with its two spires of different heights, and Wulpen with one spire, may be easily recognised. Abreast of Furnes is a long white sand-hill, called Broers duyn (Brother's down), which is a little more elevated than the adjacent greenish hills, and may be known by its barren appearance. Nieuport has several steeples and windmills, which sometimes appear like a fleet of ships; but the great church steeple, which is square with a turret, shows conspicuously among them.

From the entrance to Nieuport the land trends east 9 miles to Ostende, the coast being all low sand-hills. In the intermediate space are several churches; Lombarzyde, with a high flat steeple, about a mile to the north-east of Nieuport; Westende church has a spire, and Middelkerke a high white tower surmounted by a spire, which shows well above the sand-hills. Mariekerke, with a small tower topped by a short spire, is only now and then visible.

Ostende stands close to the shore, and is very prominent from the offing, from whence it often makes as an island. Among its principal objects are the tall tower of its cathedral, which is surmounted by a short spire; its handsome lighthouse with buildings at its base, near the western jetty, in the north-east corner of the town; a windmill near the latter and the lighthouse upon the sand-hills to the northward.

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* *See* Admiralty charts:—North sea, Sheet 1, No. 1,406; scale, $m = 0·3$ inch; and Dunkerque to the Schelde, No. 1,872; scale, $m = 0·5$ inch.

Life-boats.—At Nieuport there are two life boats, one on each side of the harbour ; at Ostende there are three, one in the harbour, one on the east, and one on the west side ; at Blankenberghe one boat is stationel on the strand, and one on the strand at Knocke.

MIDDELKERKE BANK.—The north-easternmost of the Flemish banks have received the names of the towns abreast which they lie. Middelkerke bank, the westernmost of them, is 3½ miles within the Out-Ratel, and fronts the coast between Nieuport and Ostende. It is 6½ miles long in a N.E. ½ E. and S.W. ½ W. direction, from the depth of 5 fathoms upon each end; the least water, 2¾ fathoms, is about one-third from the southern end of the shoal, from whence Nieuport steeple bears S. ¾ W. 8½ miles, and Ostende church tower S.E. ½ E. 8¼ miles. From the south-west end of the bank Nieuport bears S. ½ E. 7 miles, and from its north-east end, Ostende church S.E. by S. ½ S. 8½ miles.

At 1½ miles north-westward of the Middelkerke is the **East Breedt**, between which ridge and the Middelkerke bank is the North channel, noticed in page 78, with depths of from 5½ to 8 fathoms in it.

NIEUPORT BANK, lying off Nieuport and abreast the south-west end of the Middelkerke bank, is connected by broad and shallow flats with the Smal and the Stroom banks. It is 6¾ miles long in an E.N.E. and W.S.W. direction, from the depth of 2 fathoms at each end, and three-quarters of a mile wide, and over a considerable portion of it there are from 7 to 9 feet at low water. From the south-west end of the shoal the outer part of Nieuport pier bears S.E. ½ E. 4 miles, and from its north-east end Ostende pier bears E.S.E. 6 miles.

OSTENDE BANK, within the Middelkerke bank, and connected with it at its south-west end, has from the depth of 5 fathoms at this extreme, Ostende pier bearing about S.E. by E. ¾ E. 7½ miles, and Nieuport pier S.S.W., distant 6 miles; and from this point the bank trends E.N.E. for 7½ miles to a well defined termination in 5 fathoms. The north-eastern portion of the shoal has 3 fathoms over it, but over the body of it for a considerable breadth, no greater depth than 2 fathoms should be reckoned upon. A channel, nearly a mile wide, with 4 and 7 fathoms in it, leads obliquely between the Nieuport and Ostende banks to Ostende Outer road.

Caution.—A heavy breaking sea rolls over the Middelkerke and Ostende banks during northerly gales, and, it is said, alters the position and depths of the shoal patches.

STROOM BANK, which protects Ostende Inner road, and assists in defending Nieuport road to the northward, is the innermost shoal of the group as well as a dangerous one, and extends the entire distance between

Nieuport and Ostende. From the depth of 3 fathoms upon its west end, which is separated from Nieuport bank by the North-east channel, which is only half a mile wide, Nieuport pier bears S. by W. 2 miles, and from thence, the general direction of this shoal being E. ½ N. for 12 miles, the distance between it and the coast decreases gradually, and its east end is only separated from the shore flat by a narrow and shallow channel, with 2½ fathoms water in it.

The summit of the bank, which is narrow and subject to change, has for a considerable distance only from 3 to 6 feet over it at low water; this shallow and dangerous portion extending from the distance of 4 miles N.E. by E. ½ E. from Nieuport pier to 3 miles beyond Ostende piers, which it approaches to within three-quarters of a mile. The south side of the shoal is steep, and consequently dangerous, but when this has been cleared, the depths towards the shore will be found regular.

WENDUIN BANK begins about 2½ miles E. by S. of the Ostende bank, and with it is included on the 5-fathom shelf off from the shore, and lying nearly parallel to the shore extends to abreast Blankenberghe, a distance of about 7½ miles. The west end of the bank, which partly defends Ostende Outer road to the north-eastward, has 3 fathoms upon it, but the shallow part of the shoal has only 9 feet over it, from whence the water gradually deepens towards its east end, where, in 2¾ fathoms, Blankenberghe church bears S.E. by S. 2¾ miles. The general direction of the Wenduin is E. ½ N., and, consequently, like Stroom bank, its eastern end is nearer the shore than the western end.

Buoy.—A white buoy with red bands and surmounted with a ball, is anchored in 3¾ fathoms on the outer side of the north-east end of Wenduin bank, at 3½ miles from the shore at Wenduin. Ostende lighthouse bearing S.W. 7¾ miles, and Blankenberghe lighthouse S.E. 4¼ miles.

NIEUPORT ROAD and WEST DEEP, directly opposite Nieuport, is bounded on its inner side by the Broers and flat bordering the coast; by the Traepegeer to the westward; the Nieuport bank, and the flat adjoining it to the northward; and by the Stroom bank to the eastward. The road including West deep, with 3¾ to 9 fathoms in it, over good holding ground of mud and sand, is for the most part a mile wide as far as the North-east channel, where it narrows to half a mile; and, considering its eastern boundary to be in the line of Nieuport steeple and the beacon at the entrance of the port, the West deep is between 7 and 8 miles long.

There are four passages into Nieuport road, but, enclosed as it is by banks, they are only to be used at low water by small vessels. The first is from the westward in continuation from Dunkerque road; the second from the northward through the North channel and over the 3-fathom flat connecting the Smal and Nieuport banks; the third from the north-eastward through the North-east channel, between the Nieuport and Stroom banks; and the fourth from the eastward is the Eastern channel, between the Stroom bank and the shore in continuation of Ostende Inner road.

LIGHT.—At Pannes a *fixed green* light is exhibited from an iron stand on a sand-hill, for the guidance of fishing boats. The light is 49 feet above high water, and visible in clear weather for a distance of 5 miles.

DIRECTIONS.—In proceeding to Nieuport road from Dunkerque road, which is the best manner of approaching it, it is necessary to use the Zuydcoote pass, pages 70, 78. It is only at high water and with a fair wind that this Pass can be used by vessels of large draught, but it is available at low water to those drawing less than 15 feet. The leading mark is the great steeple at Bergues appearing westward of Leffrinckoucke church, S.W. by S. ¼ S., but should the weather be hazy, then use Zuydcoote (Sables) old tower, bearing S. by W. ½ W., as the channel mark, which, however, crosses the tail of the Traepegeer bank.

The channel, which has a depth of 3 fathoms, is rather over towards the red buoys, and then two cables' lengths to the northward of the black buoy. In passing through, it is necessary to be cautious of the spit of the Traepegeer, which has 6 to 9 feet upon it, and extends to within a mile of the south-east red buoy upon the Hils. Having entered West deep the Smal bank must be approached with great caution, as it is extremely steep and dangerous N. by E. ¾ E. of Sables tower. It will, therefore, be prudent when out of the Pass and the water deepens to 7 fathoms to steer E. ¾ N., and having run 8 miles the vessel will be abreast Nieuport.

Anchorage may be taken up with the jetty or pier at Nieuport bearing S.E. easterly distant 2½ miles, in a depth of 6 to 8 fathoms, sand and mud. A small vessel may approach nearer to the jetty and anchor in 23 to 26 feet water.

The approach to Nieuport road from the northward being through the North channel and over the flat between the Smal and Nieuport banks, is but little frequented on account of the distance of the passage off shore, rendering it difficult to distinguish objects that may be used as marks. Vessels sometimes leave the road by it with a fair wind and at the top of a spring tide, and then it is usual to cross the flat in 3 fathoms with Furnes church on with the west side of Broers duyn, South, and when the water has deepened to 4 and 4½ fathoms, then to make good a N.E. ½ E. course for 10 or 12 miles to a position clear of all the banks. Vessels drawing 12 feet and less, under similar circumstances, cross the western part of the Nieuport bank after first quarter flood with Nieuport steeple S.S.E. easterly, and when the water deepens they stand to the north-eastward as before. In this latter case, the Middelkerke bank need not be regarded, if the water be smooth.

The North-east channel between the Nieuport and Stroom bank is comparatively narrow, and is the only passage between Ostende Outer road and Nieuport road. From the Outer road with Ostende bearing S.S.E., steer W. by S. ½ S. for 9 miles, passing the 3-fathom tail of the Stroom bank, until Nieuport steeple and beacon appear in line; but this channel is altogether unsafe to a stranger.

The Eastern channel is within the Stroom bank, and connects Nieuport road with Ostende Inner road. In using this passage, care must be taken of the south edge of the Stroom bank which is steep, but towards the south side of the channel the depths are regular, and the vessel's distance from the shore may be determined by them. Vessels of large draught may sail at a proper time of tide from Nieuport small road to the Schelde, through this channel, or by the North-east channel through Ostende Outer road.

NIEUPORT is near the outlet of the Yser. The town is well fortified, particularly towards the sea. Its population, amounting to about 3,000, is principally employed in brewing, distilling, the manufacture of rope and sail-cloth, ship building, and fishing. There is railway communication with Ghent.

The harbour is small, and only fit for small craft. The outlet of the river is defended eastward by a pile pier or jetty, and upon the bar, which is a cable's length outside the jetty head, there is a depth of one foot at low-water springs. The mark for leading across the bar and just to the westward of the pier-head, is the lights in line S.S.E.

There are from 18 to 20 feet water at a quarter mile from the jetty head; farther in the depth decreases very quickly to the bar. No vessel should attempt to enter Nieuport without a pilot, unless forced to take the harbour without such assistance, when enter just to the westward of the pier-head; then keep in the channel as nearly as its direction can be made out, and on arriving at the remains of an old boom, if no pilot is ready, lay the vessel upon the sand on the western side, which may be done with safety.

LIGHTS.—A *fixed red* light is exhibited at Nieuport from a stone tower one mile inland, at an elevation of 96 feet above high water, visible 10 miles.

Tidal, also a *fixed* white light is shown from the west side of the harbour whilst there are 12 feet water on the bar. The light is 32 feet above the sea, and can be seen 6 miles.

Life-boats.—There are two life-boats with a life-saving apparatus at Nieuport.

TIDES.—It is high water, full and change, at Nieuport, at 0h. 18m.; springs rise 16 feet, and neaps 13 feet.

OSTENDE OUTER ROAD, situated outside Stroom bank, and protected by the Nieuport, Ostende, and Wenduin banks, is 5 miles long, east and west, and one mile wide, with a depth of 5 or 6½ fathoms over a bottom of sand and oaze. It is the common anchorage for large vessels waiting wind or tide to enter the harbour of Ostende. The anchorage is about 2½ miles off shore with Ostende cathedral bearing S.E., and Nieuport church appearing just to the southward of a prominent sandhill, S.W. There is also good riding in 6 fathoms, clay, with the town of Ostende bearing S. by E., Middlekerke S.W., and Blankenberghe E. ½ S. nearly.

There is good holding ground, in 11 fathoms, fine sand and mud, with Ostende bearing about S. by E. ½ E. 7 or 8 miles distant. In this latter anchorage the Ostende pilot boats are to be found in bad weather, especially when the wind is from the northward.*

DIRECTIONS.—The Outer road is generally entered either from the direction of the Schelde within the Wenduin bank, or from the northwest between the Middelkerke and Nieuport banks and Ostende bank. For the latter route the mark is the steeples of Oost Duynkerke and Furnes in line bearing S.W. by S., until Ostende lighthouse bears S.E. ¾ E., which latter bearing will then lead into the road.

At night, after having sighted Ostende light, which may be seen at a distance of 20 miles, it will be prudent to heave to, and stand off and on, or to anchor outside the banks, and wait for daylight. Vessels, however, of 15 feet draught and under, may, when the water is smooth, cross the north-east tail of the Ostende bank and the west tail of the Wenduin bank, and enter the Outer road, with Ostende light bearing S. by E. ½ E. The least depth in this track, with the sands in their present state, is 3¾ athoms.

CAUTION.—Easterly gales are comparatively harmless to vessels at anchor in the Outer road, but it is necessary to guard against those from the westward or south-westward; with such, it will be better to weigh and gain an offing without loss of time, or, if the wind be from the north-westward, to run for the Schelde. For this purpose, make good an East course for 10 miles, so as to pass within and well clear of Wenduin bank, and when abreast Blankenberghe, steer to the N.E. for Wielingen channel light-vessel.

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* *See* Admiralty plan, Ostende roads, No. 125; scale, $m = 3 \cdot 6$ inches.

OSTENDE INNER ROAD, comprised between the Stroom bank and the shore, has but indifferent holding ground, especially in the neighbourhood of the harbour, and it should not, therefore, be used in bad weather. It is entered from the Outer road by small vessels, by keeping Ostende church on a S.E. bearing; it is necessary, however, to wait for half flood, as there is but from 3 to 6 feet upon the ridge of the Stroom at low-water springs.

To the westward of Ostende a base of 2,624 yards in length is measured parallel to the shore. The west end at Raversyde is marked by two beacons with triangular heads, and the east end by a beacon and the steeple of Mariekirke.

DIRECTIONS.—In approaching this road from the offing, the Stroom bank may be crossed by small vessels to the westward of Ostende, but to do so they should take half flood. The western end of the bank may be passed in 10 to 11 feet at low water, with Westende church S. ½ W. Vessels generally cross the Stroom well to the westward, so as to have the advantage of going with the flood in entering Ostende harbour. The shore opposite Westende is shallow for nearly a mile ; but the flat becomes narrower and steeper towards Ostende. In the western part of the road the depth is 4 or 5 fathoms, which continues as far as Raversyde ; it then shallows gradually, and off Ostende there are not more than from 19 to 21 feet.

Vessels under 12 feet draught, bound to either of the roadsteads of Ostende, and waiting for tide to cross the banks, will pass clear of all dangers at an offing of from 6 to 7 miles, anywhere between Nieuport and Blankenberghe. In foggy weather a vessel will know whether she is to the eastward or westward of Ostende by the nature of the bottom, which near the shore and to the eastward of the harbour is muddy and rather sticky ; whereas at and beyond one mile to the westward the bottom is hard sand.

OSTENDE is a strongly fortified town, it being an important position in the defence of Belgium, and the fortifications, with the promenade in front, named the Digue, command attention from the roads. Ostende is much frequented for sea bathing; it is connected by railway with all parts of Belgium, and with France and Germany ; and steamers ply to Havre, London, and Dover.

The harbour, which is an artificial work, skirts the east side of the town ; its outlet is defended on both sides by open timber piers, and curves from a northerly to a north-westerly direction, to the outer part of the dry flat. The harbour forms the sea-terminus to the numerous canals, which, stretching from hence like a network into the interior of the country, furnish admirable facilities for commerce; the canal from Ostende to Ghent is upon a large scale, and available to vessels of considerable burden. A chain of docks has also been formed between the arsenal and the town.

Ostende contained in 1870 about 18,000 inhabitants. In 1873, 1,406 vessels amounting to 186,718 tons entered inwards, and 1,417 vessels of 186,440 tonnage cleared outwards; the mail packets run regularly one each way to and from Dover six times a week.

A telegraphic cable extends from Ostend to the South Foreland.

The Bar has 2 to 4 feet over it at low-water springs, is about a third of a cable's length outside the pier-heads, and when there is water enough over it for a vessel to enter the harbour, the Stroom bank may also be crossed. The water on the bar is much influenced by the prevailing winds, the depth being less after a succession of north-easterly winds.

LIGHTS.—The light-tower erected in 1859 at Ostende, stands 820 yards E. by S. of the north-east corner of the town, on the eastern side of the entrance to the harbour. It exhibits a *fixed* white light, which is visible from seaward when bearing between E. ¼ N. and S.W. ¼ S. The light is of the first order, elevated 189 feet above the mean level of the sea, and visible in clear weather from a distance of 20 miles.

A *fixed green* light upon the western pier-head is shown at an elevation of 25 feet, and is visible at a distance of 5 miles.

Tidal lights and signals.—The depths into the harbour, during flood and ebb, are indicated at night by the various lights, as follows:—

At night.—On the east pier-head, at an elevation of 25 feet above the sea, is exhibited a *fixed red* light, visible for a distance of 5 miles. The entrance of the port must not be attempted except when this *red* light is lighted.

With rising tide,—

When there is a depth of 11 feet over the bar. A *fixed red* light visible 5 miles will be exhibited from the jetty angle, (in addition to the *red* light on the east pier-head,) at 30 feet above high water, until there are 16 feet on the bar, when this light is extinguished.

With falling tide,—

Immediately the light showing 16 feet and above is extinguished, the *red* light on the jetty angle will be shown (together with *fixed red* light at extremity of east pier-head) until the moment the depth is less than 11 feet on the bar.

16 feet over the bar.	A *fixed* white light from the battery 50 fathoms within the east pier-head, at an elevation of 40 feet, and visible 7 miles.

19 feet over the bar. A small *fixed* white light about 14 feet under the light shown for 16 feet over the bar, on the east pier.

By day the height of the water over the bar is indicated as described below by balls and flags hoisted on a mast from a signal house, near the lighthouse. The balls are black.

6½	feet.	A blue pendant at half mast.
7¼	„	„ at mast head.
8	„	A ball at half mast.
9	„	„ at mast head.
10	„	A blue flag hoisted to the top of the signal house.
10¾	„	A blue and white flag hoisted do.
11¾	„	„ „ at half mast.
12½	„	„ „ at mast head.
14¼	„	A blue flag at mast head.
15¼	„	„ „ with ball below.
16	„	„ „ with red pendant below.
17	„	„ at half mast.
18	„	A white flag with blue cross at mast head.
19	„	A ball at mast head over a white flag with a blue cross.
19¾	„	A red flag at mast head.
20⅓	„	A ball at mast head over a red flag.
20¾	„	A red flag at mast head over a red pendant.

In foggy weather a bell is rung at the east pier for five minutes every quarter of an hour while there is a depth of 16 feet over the bar.

PILOTS for Ostende are obtained at Blankenberghe, or in the Outer road, from one or other of the pilot vessels which cruise about; these vessels are sloop-rigged, they carry a blue flag, with a distinguishing number on it, and have the name Ostende in the mainsail. Pilotage is compulsory.*

Life-boats.—There are two life-boats stationed at Ostende, one on each side of the harbour entrance, also a life-saving apparatus.

DIRECTIONS.—As the flood runs eastward for about three hours after it is high water in Ostende harbour, vessels intending to enter should keep to the westward until there is sufficient depth on the bar for their purpose. The course in is S.S.E. Should the wind blow from the northward, and a vessel be forced to run for the harbour without a pilot, she must be kept westerly, with the cathedral well open to the westward of the lighthouse, and caution be observed with respect to the easterly set of the flood stream across the harbour's mouth. The ebb sets to the westward until two hours after low water. Having entered rather over on the west side, then keep along the eastern jetty to its inner end, when the vessel can be warped to a convenient berth.

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* In addition to the cutters employed on pilotage service in the North sea and English channel, the Belgian Government has since the beginning of the year 1857 stationed an iron screw steam schooner to cruize between the Isle of Wight and Dungeness, for the purpose of supplying licensed pilots to ships bound to Antwerp and other ports of Belgium. The pilot schooner carries mainsail, fore and aft foresail, foresail, and jib, She has *Antwerpen* painted on her mainsail, and flies a red flag at the main, with the number 5 in white on it.

By night the white light from the lighthouse, and tide light on the east pier kept in line S.E. by E., will lead across the bar, clear of the west pier-head, and into the entrance, when proceed as before directed.

TIDES.—It is high water, full and change, at Ostende at 0h. 25m.; springs rise 17 feet, and neaps 13¼ feet; neaps range about 11¼ feet. Strong N.N.W. winds have the effect of raising the level by several feet, whilst those from the eastward decrease it.

The COAST in continuation from Ostende bounds the outlet of the Schelde to the south-westward. It has a general E. ½ N. direction, and presents the same features as that already described, being low and sandy, and with but few objects to assist in identifying it from the offing. At 3 miles to the eastward of Ostende are some sand-hills called Spaniard duin, which are more elevated than the others, and there is another sand-hill very apparent between there and Wenduin. Wendum church 7¼ miles from Ostende has a large white tower, and the sand-hills in front of it are above the average height.

Blankenberghe stands close to the shore, at 9 miles from Ostende, and there are generally numerous boats and bathing machines upon its beach. West of the fort are two docks with an entrance through the beach in a north and south direction. The tower of the church is terminated by a short spire or peaked roof, known among sailors by the term bluff, in order to distinguish it from the common square steeple, as well as from the spire. Blankenberghe is further marked by a small fort, near which a light is exhibited, and several windmills, and the two lofty steeples of Bruges will generally be seen inland of it; the port is connected by rail with Bruges and Heist. The church at Heist has a long nave, and a tower with a sharp roof. Its lighthouse is a plain object to the north-east of the church. The Leopold canal is entered from the shore about half a mile west of Heist lighthouse.

Knocke church has a white tower with a stunted spire and spindle, and there is a watch-house and flagstaff upon the sand-hills to the north-eastward of it. Cadzand island, which with Walcheren island forms the entrance of the Schelde, is about 11 miles long, and low like the rest of the coast, but with several churches and mills. Groede church, near the middle of the island, has a telegraph upon it.

Life-boat.—Blankenberghe is a life-boat station.

LIGHTS.—At Blankenberghe a *fixed* white light is shown from an octagonal stone lighthouse W. ½ S. half a mile from the small fort. It is elevated 83 feet above high water, and is visible at a distance of 12 miles.

A *fixed green* fishing light, elevated 26 feet above high water, and visible for 4 miles, is exhibited from an iron stand on Blankenberghe western harbour mole.

Heist, a *fixed green* fishing light is exhibited on the custom-house north of the town. It is elevated 26 feet above high water, and visible at a distance of 3 miles.

Knocke downs, north of the village, a *fixed* white light is shown from a square tower 68 feet high on the keeper's dwelling. The light is 87 feet above the level of the sea, and can be seen 12 miles.

The SCHELDE, or Scheldt, one of the most important rivers of the Netherlands, takes its rise in the French department L'Aisne, traverses a part of France, East and West Flanders, and flowing by Ghent, receives the navigable waters of the Lys and two large canals ; it then turns easterly to the province of Antwerp, and then northerly between that province and East Flanders. At Antwerp, the Schelde is a quarter of a mile wide, and in places carries upwards of 7 fathoms water; abreast the lower part of the city it forms a capacious and secure harbour, fitted for the reception of large ships. About 15 miles lower down, the river divides into the East and West Schelde ; the former winds round the east and north-east sides of Beveland island, and south of Schouwen island, to the sea. The latter branch, which is the main stream, flows westerly between the mainland of Dutch Flanders on the south, and the Beveland and Walcheren islands on the north, and joins the sea below Flushing. The whole course of the Schelde is 211 miles, and its mouths being directly opposite the Thames, gives to it both naval and commercial importance.*

WALCHEREN ISLAND.—The Northern coast of this island is composed of white sand-hills, and presents everywhere a clean landing beach ; the western sand-hills are high in comparison with the others. Near this extremity of the island is West Kapelle, the tower of the old church being one of the most prominent objects on the coast, and generally to be seen from a distance well outside the sands at the entrance of the Schelde. To the westward of the church, and close to the shore, is a windmill.

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* *See* Admiralty chart :—Entrance of the Schelde to Antwerp, No. 120 ; scale, *m* = 1 inch.

MIDDELBURG, the capital of the province of Zeeland, is near the middle of Walcheren; it has numerous spires and towers, and one of the former is very useful as a sea-mark; the population in the year 1850 amounted to 15,934. Middelburg is connected with Flushing by a ship canal, and with Veere on the north-east side of Walcheren by a canal called Middelburg haven. This place will always be remembered as the scene of the loss of 7,000 men to the British army in 1809 during the ill-fated Walcheren expedition; the loss arose principally from fever and ague, due to the marshy nature of the country.

FLUSHING.—High sand-hills, which appear as distant hummocks from the offing, extend from West Kapelle to the strongly fortified town and arsenal of Flushing (Vlissingen), which, with the outwork at Breskens on the opposite side of the Schelde, completely commands the river. The spire of its church, the large square stadthouse, and the building sheds, and other works pertaining to a naval arsenal, taken in connexion with its advanced position upon the south point of Walcheren, render Flushing prominent from every part of the entrance to the Schelde. It has several convenient jetties, and two safe harbours, which dry at low water; but to the eastern one there is a basin attached, in which ships of war are laid up in ordinary. When the railway, now being made, is completed to Flushing, every part of Europe may thence be reached. Population 12,000.

Above Flushing the bed of the Schelde is occupied by numerous sand-banks, which render the navigation intricate, and the aid of a pilot indispensable. It is, therefore, not considered necessary to supply a particular description of it

Docks.—The following are the dimensions of the docks at Flushing:—No. 1 dock, length over all, 243 feet; breadth of entrance, 52 feet; depth over sill, 14 feet. Three floating docks, breadth of entrances, 65 feet each; depth over sill, 25 feet each. In two of these docks vessels drawing 25 feet can enter. There is also a patent slip at Flushing.

LIGHTS.—East gat lighthouse is of iron, and bears N. ¾ W., 1,530 yards from West Kapelle lighthouse. The light is a *fixed* white light, visible seaward between the bearings of S. by W. and N.E. by N., elevated 59 feet above the sea, and should be seen in clear weather from a distance of 13 miles. This light in line with West Kapelle light S. ¾ E. leads over 25 feet water between the Steen banks to the East gat.

West Kapelle light is a *fixed* white light, shown from a lantern, surmounting the tower of West Kapelle, at the west end of Walcheren. It is elevated 144 feet above high water, and in clear weather is visible 20 miles. This light is obscured when bearing westward of S.S.W. to clear Banjard banks.

Domburg, a *fixed red* and white light, showing *red* between the bearings of S.E. ¼ E. and E. by S. ⅓ S., and white to the southward of E. by S. ⅓ S., it is exhibited on a high duin near Domburg to mark the termination of the leading lights, or where they must be abandoned on entering the East gat.

Zoutlande light is *fixed*, S. by E. ½ E., 1¾ miles from West Kapelle light, it is exhibited from a building on the sand-hills, which is elevated 45 feet above high water, and can be seen 10 miles between the following bearings from the southward,—North to N.W. ⅔ W.

Kaapduinen, two *fixed* white lights are exhibited on the sand-hills 2 miles S.S.E. from the last, they bear N.W. by N. and S.E. by S. from each other at 126 yards apart, the northern is elevated 47 and the southern 89 feet, and should be visible 10 miles between the bearings from seaward of S. by E. ½ E. to S.E. ⅛ E.

On the same sand-hills, but rather nearer the sea, are also exhibited two *fixed* white lights, the northern elevated 92 feet and the southern 26 feet above high water, they are N. ¼ W. and S ¼ E., 220 yards from each other, and are visible between the bearings of E. ¼ N. round by north to W. ¼ S., and in clear weather for a distance of 6 miles.

The Kaapduinen lights, together with that at Zoutlande, are leading lights, and are intended for the navigation of the Oost (East) gat.

At Flushing a *fixed red* and white light is exhibited at 49 feet above high water, from the West Haven bastion, and in clear weather is visible 10 miles from every direction seaward. The line of separation between the red and white lights is in the direction of the Nolle plaat on an E. by S. ½ S. bearing from seaward. The light showing red to the northward of this line and white to the southward. It is obscured landward between N.N.E. and S.E. by E.

On the West jetty head is exhibited at an elevation of 14 feet above the sea a *fixed red* light, visible 4 miles. From the East jetty head a *fixed green* light is shown, which is also visible for 4 miles.

Nieuwe Sluis three lights are shown on the embankment at the north end of Kadzand island, or at the south entrance of the river; the eastern two are *fixed* white lights, 1,110 yards apart, the upper is elevated 83 feet and is visible 14 miles seaward between the bearings of S.E. by E. ⅔ E and E. ¼ N.; the other 43 feet, visible 11 miles northward of bearings between E. ¼ N. and W. ¼ S.

A small *fixed red* and white light is shown from an elevation of 26 feet, 2,730 yards West of the last, and can be seen 4 miles. It is *red* westward of S.W. by S., and white between the bearings of S.W. by S. and W. by S. The change from red to white indicates that the line of the

Nieuwe Sluis lights must be departed from, and that the Kadzand and Hompel bank has been doubled.

At Breskens are two small *fixed* lights, 192 yards apart, leading up the canal to that port.

Beacon.—A short distance to the westward of Nieuwe Sluis, on the end of a mole bearing nearly North from Groede, stands a beacon 15 feet high, surmounted by a ball.

PILOTS.—Vessels are stationed at the mouth of the Schelde to supply Belgian pilots to ships bound to Antwerp or Ghent viâ the Terneuse channel. These vessels bear the following distinguishing marks:—The word *Antwerpen*, surmounted by the letter P, painted in black letters on both sides of the sail, as also the number of the boat; at the mast head a red flag, on which is the number of the boat in white figures, and on the stern of the boat the words *Bateau Pilote*, and her number. Each pilot is invested with a medal showing his station, grade, and number, and is also furnished with instructions for the guidance of masters of vessels, printed in the English, French, Dutch, Danish, German, Spanish, and Italian languages.

Life-boat.—West Kapelle is a life-boat station.

SANDS and BUOYAGE.—The Fairy, Hinder, and Bligh banks, and Thornton ridge, shoals lying in the offing abreast the Schelde, and obstructing the approach to it, have been described in Chapter III. There are also within or to the north-east of the Thornton ridge, shoals of a similar character, such as the Rabs, Middel and Steen banks; but as these latter are opposite the Roompot to the northward of Walcheren, they will be noticed under the head of East Schelde, pp. 117–119. The sands encumbering the approach to and entrance of the West Schelde are as follows:

HET ZAND.—On the south side of Wielingen channel the 4-fathoms edge continues to the eastward of Wenduin bank nearly directly to the main a little eastward of Kadzand, where it is steep, having 5 fathoms close to it. The outer portion of the space thus bounded is known as Blankenberghe flats. The Hetz zand is a ridge inside Blankenberghe flats, and joining Wenduin bank with Binnen Paarde-markt, having from 19 to 20 feet water upon it. Between this ridge and the shore the water deepens again and forms a gully in continuation to the westward of the Appelzack, with from 21 to 24 feet water in it.

BINNEN PAARDE-MARKT, is a shoal commencing at 1¼ miles North of Heist and extending along the shore in an easterly direction, joining it a little to the eastward of Kadzand. There are 14 to 17 feet water at its western end, but from the middle of the bank to its eastern extremity there is not more than from 2 to 6 feet, and close to the 4-fathoms edge of the flat. At half a mile to the west of the west extremity of the bank there is an isolated shoal with 17 feet water on it. Between Binnen Paarde-markt and the shore is a gully called Appelzack, with from 4 to 5½ fathoms water in it.

Paarde-Markt is a small ridge, extending from the outer flat up the centre of the deeper water of the Wielingen channel, to nearly abreast Kadzand; it is about 2½ miles long, E. ½ S. and W. ½ N., and less than two cables wide, and consists of four separate knolls with from 28 to 29 feet water on them. The channels on both sides of this shoal are nearly a mile wide.*

LIGHT-VESSEL.—The light-vessel, for leading through the Wielingen channel, lies in 4¾ fathoms N.E. ½ N. 4½ miles from Blankenberghe church, and N.N.W. 3½ miles from Heist lighthouse. From an elevation of 39 feet a *flashing red* light is exhibited, visible 9 miles; the vessel is painted in red and white horizontal belts, with "*Wielingen*" in white letters on her side; by day two cones are exhibited below the lantern. A bell is sounded during fogs.

Kadzand Bank, at the east end of Wielingen channel in its narrowest part, is attached to the Hompel. This bank has almost entirely disappeared from the effects of the tides, 26 feet being the least depth on it. The channel between it and the shore, is one third of a mile wide at the narrowest part, with 7 to 13 fathoms.

RIB ZAND and HOMPEL is the northern boundary of Wielingen channel, and the southern boundary of the Spleet. The general direction of these shoals is from East to E.S.E., and their combined length 12 miles; they have a considerable curve to the northward, and average a quarter of a mile broad. The Rib zand was formerly a continuous bank with the Hompel, but within the last few years it has been divided by the current into two separate banks, with deep water between them. The west bank, named Bol van Heist is a mile long, and has 10 feet water on it; the west end of the bank in 15 feet bears E. ¾ N. 1¼ miles from Wielingen light-vessel. The Bol van Knocke, 2¼ miles East of the Bol van Heist, is 1½ miles long, with as little as 10 feet water on it. Both sands are steep-to on their south side.

Le Hompel, 4 miles in length, is in continuation of the Rib zand to the E.S.E, with 7 feet water near its west end, and 4 feet at its east end, with a patch between that dries. Its eastern extreme, in 13 feet water, bears North 1¼ miles from Nieuwe Sluis *red* light. The bank is steep-to on its south side.

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* In the various channels from sea into the harbours between the Schelde and the Texel the black buoys are to be kept on the port hand when going in, and the white buoys on the starboard hand. The white buoys with a broad red ring may be passed on either side. Wreck-buoys in all cases are chequered black and white.

Buoys.—The Outer buoy of the Wielingen channel, a black nun of large size, with a staff and ball, lies in 4¾ fathoms water, W. by N. ½ N. 2¾ miles from the light-vessel; the marks for it are the steeples of Bruges in line with a sand-hill to the eastward of Blankenberghe, named Lucifer duin, S. ½ E. 4 miles from the shore, and Knocke steeple, just to the eastward of the Gaanpad (a high sand-hill near it) S.E. ½ E.

Seven black buoys, besides the outer buoy, mark the south side of the Rib zand and Hompel, and serve to indicate the north side of Wielingen channel. Their respective bearings and distances are as follows:—No. 1 buoy, moored near the west end of the Rib zand in 28 feet water, 2 cables S.E. of the light-vessel, bears E. by S. ¾ S. nearly 3 miles from the Outer buoy; No. 1 to No. 2 buoy, near the south-west end of Bol van Heist, E. ½ N. 1½ miles; No. 2 to No. 3 perch buoy, in 27 feet water, at half a mile to the westward of Bol van Knocke, E. ¾ N. nearly 3 miles; No. 3 buoy to No. 4, E. by S. ½ S. upwards of 2 miles; No. 4 buoy to No. 5 on the south side of and near to 7 feet water on Hompel bank, E. by S. 1⅔ miles; No. 5 buoy to No. 6, E.S.E. 2½ miles; No. 6 to No. 7 buoy, at the south-east end of Hompel bank, E. by S. ½ S. one third of a mile; No. 7 buoy bears N. by W. rather more than a mile from Nieuwe Sluis red light, and W. ½ S. 4¼ miles from Flushing West Haven lighthouse.

On the south side of the channel about half-way along the Binnen Paarde-markt, a white buoy is moored in 28 feet water, bearing S. by E. 2 miles from No. 3 Bol van Knocke perch buoy, and N.E. by N. 2 miles from Knocke lighthouse; to mark the south side of French (Fransche) pass, a buoy with red and white horizontal bands is moored in 28 feet water near the east end of Binnen Paarde-markt about abreast of Sluis gat; and a conspicuous beacon is placed on the head of the stone dam which extends from the sea dike of Groede en Baant polder: a white buoy is also placed near the west end of Plaat van Breckens in 22 feet water at half a mile N.E. ¼ E. from Fort Frederik Henrik.

DE WANDELAAR BANK, at the entrance to Wielingen channel, has an average depth of 3½ to 4 fathoms, with a shoal part of 15 feet near its west end.

Buoy.—About 4 cables south-westward of this shoal part, a conical buoy painted black and red horizontal bands, with staff and ball, is moored in 29 feet, with Uijtkerke church nearly in line with the west side of West Bath hotel, Blankenberghe; Heijst church in line with Stakerdum sluices outlet; Blankenberghe church bearing S.S.E. ½ E.; and Wielingen light-vessel E. by S. ½ S. 5¼ miles.

SCHOONEVELD, RAAN, WALVISCH-STAART, and ELBOOG, at times called collectively the Raan, are four sands lying nearly in the middle of the mouth of the Schelde. They curve in a direction nearly parallel to the Rib and Hompel, and form between the latter and themselves the Spleet channel, which is tortuous and unbuoyed, while together they constitute the south-west side of Deurloo channel, which is the middle or north-western entrance into the Schelde.

The Schooneveld bank is irregularly shaped, with some outlying patches to the westward; a large portion of it carries 17 feet water, but the prevailing depth upon the remainder of the bank is 3 fathoms. The south-western, or outer patch of the Schooneveld, lies N.E. by E. ½ E. 3 miles from the outer buoy of Wielingen channel, and North 2½ miles from the light-vessel.

The Raan, or ridge of the Raan, is an extensive flat about 3 miles wide N.N.E. and S.S.W. at its western end, the bank narrowing towards its eastern end, upon which the Walvisch-Staart and Elboog banks are based, and the shallowest portion of it, abreast the Knocke, with as little as 6 feet upon it, is at its southern edge.

The Walvisch-Staart, or Whale's tail, is abreast the Hompel, and its western end is joined to the Knocke and Hompel sands by a 4-fathoms ridge. A great portion of the Staart dries at low water.

The Elboog, on the north-east side of the Staart, extends to abreast Flushing, and forms the western boundary of Flushing road. Nearly all the south-eastern or inner end of the Elboog dries at low water.

Buoys.—The south-west side of the Deurloo channel is marked by the following white buoys, which lie on the north-east side of the Raan and Elboog. The outer or No. 1 buoy lies in 3 fathoms, S. ½ E. 1¾ miles from the outer red buoy of the Deurloo channel, with Bruges church open east of Heist S.S.W. westerly, and Middelburg spire just to the northward of Zoutelande church E. by S. ¾ S.; No. 1 buoy to No. 2, S.E. ¼ S. 1¾ miles; No. 2 buoy to No. 3, S.E. by E. 3¼ miles; No. 3 buoy to No. 4, S.E. ¾ E. 1¾ miles; No. 4 to No. 5, E. by S. ½ S. 1¼ miles; No. 5 to No. 6, S.E. 1½ miles; No. 6 to No. 7, S.S.E. rather more than 1½ miles. This last buoy lies W. ¾ N., 1⅓ miles from the haven lighthouse at Flushing, and marks the western boundary of Flushing road.

CALOO, BOTKILL, RASSEN,* and ZOUTELANDE BANKS, which collectively may be termed le Rassen, make the next group of shoals, which, fronting the west coast of Walcheren in the form of an irregular triangle, separates the Deurloo channel from the East gat, and with the shore of Walcheren bounds the latter passage.

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* The name Rassen is applied by the Dutch to several smaller shoals upon this coast, and seems to imply some rotary or irregular motion of the tides in the neighbourhood, probably equivalent to the English word Race.

The Caloo and Botkill banks, which may be considered as the north-eastern portion of the Rassen, are the western boundary of the entrance to the Oost or East gat; there are several patches of from 9 to 12 feet upon them, but the prevailing depths are 2½ and 3 fathoms. The Caloo bank is separated from the Botkill by a narrow channel, the banks are unbuoyed, but the fairway buoy for the East gat, a red nun, lies in 4 fathoms 2 miles E. ¾ N. from its north-eastern end, with Middelburg spire in line with the west side of a sand-hill named Roggenbrood, bearing S.E. by S., and West Kapelle lighthouse, open a little to the westward of the Kaaphuisje, which is a small but easily distinguishable building on West Kapelle dike, a little to the westward of the Hakkelingen sand-hill, bearing S. ¼ W. This buoy breaks adrift occasionally in bad weather.

The Rassen bank is very shallow throughout; a great portion of it has less than 6 feet upon it, and three patches dry. This shoal forms the north-east boundary of Deurloo channel.

Zoutelande bank, lying within the south-east part of the Rassen is narrow, and extends in a direction nearly parallel to the shore of Walcheren at less than half a mile, from abreast West Kapelle to opposite the Kaapduinen, more than half the distance to Flushing. The depths over the greater portion of it are 2 and 3 feet, and a part of it dries. In continuation of the Rassen bank, it forms the western side of the East gat. The eastern or inner edge of Zoutelande bank is marked by three white buoys, and its south-east end has a red buoy upon it, marking the point of junction of the East gat and Deurloo channel, abreast of Kaapduinen lights.

The Kueerens, or Domburg shoal, bounds the entrance of the East gat to the eastward; but as this shoal will be described in connexion with the Roompot in the next chapter (page 121), it is only necessary to remark here that West Kapelle lighthouse S. ½ W. leads just to the westward of or outside it.

Buoys.—The outer or fairway buoy of Deurloo channel, red, in 5 fathoms, lies with West Kapelle lighthouse bearing E.S.E. 7½ miles; the steeples of Bruges just to the westward of Heist church S.S.W.: and Middelburg spire open to the southward of Zaalduin S.E. by E. ½ E. The following buoys mark the north-east side of Deurlo channel. Fairway buoy to outer or No. 1 black buoy just to the southward of a 17-feet knoll on the Drempel or bar, S.E. by S. ¼ S., 1¾ miles nearly; No. 1 buoy to No. 2, S.E. by E., 1¼ miles; No. 2 buoy to No. 3, S.E. ½ E., 1⅓ miles; No. 3 to No. 4, S.E., 2½ miles; No. 4 to 5, S.E. by E., rather more than 2 miles. This last black buoy is off the inner or south-easternmost point of the Rassen, and from it the red buoy upon the south-east extreme of the Zoutelande bank, at the inner end of the East gat, bears S.E. by E. ¼ E., 1¾ miles.

The distances between the black buoys of the Rassen and the white buoys on the Raan and Elboog marking the Deurloo channel vary from one mile to half a mile. From No. 1 or bar buoy the outer white buoy of the Raan bears W.S.W. three quarters of a mile.

Le NOLLE PLAAT extends to the W.N.W. of Flushing for 1¼ miles, having a breadth of one eighth of a mile with only 7 feet water on its western half. Its south side is steep-to.

Buoy.—A black buoy is moored at its south-west end in 24 feet water, at a quarter of a mile E. ½ N. from the S.E. white buoy of Elboog bank.

DIRECTIONS for the SCHELDE.—Vessels from the strait of Dover bound to the Schelde, generally steer such a course from the back of the Goodwin as to pass between the West Hinder and the north-east end of the East Dyck or Clif-d'Islande banks, and thus to the northward of all the Flemish banks, which gives them a clear approach to Wielingen channel. An East course made good from the vicinity of the South-sand-head light-vessel for 39 or 40 miles will take a vessel about a mile to the northward of the shoal part of the Sandettié bank to between the West Hinder light-vessel and the north-east end of the East Dyck, and then an E. by S. ½ S. course will lead to the north-east of the shoals (in clear weather within sight of Ostende) and to the Wandelaar buoy and the Wielingen light-vessel.

If from near cape Gris-nez, and intending to pass outside the banks, the following are the usual courses followed:—With that headland bearing S.E. 5 miles, a N.E. by E. course should be made good for 34 miles, which will lead 2½ miles to the north-west of 3 fathoms upon the Sandettié, and to lat. 51° 22′ N. Keep in that parallel, which is to the northward of all the banks, and passing over 7 or 9 fathoms upon the south-west tails of the Fairy and West Hinder banks, and having run 17 miles, you will be abreast of the West Hinder light-vessel, when proceed as before.

Another plan is this:—Having clear weather, smooth water, and daylight, and being in 22 fathoms with cape Blanc-nez bearing S.S.W. 10 miles, steer E. ¾ N. for 33 miles; this will lead 2 miles to the south-east of the Sandettié; 1½ miles to the north-west of the Bergues buoy, and to the position between the West Hinder light-vessel and the East Dyck before mentioned; then keep to the eastward for 25 or 26 miles upon the same parallel (51° 22′ N.), or a little more northerly, so as to avoid the north-east extremities of the banks; and the soundings, first decreasing from 16 to 13 fathoms, will then become more irregular, and vary from

11 and 12 to 9 and 8 fathoms up to the Wandelaar buoy and on to the Wielingen light-vessel.

Approaching the Schelde from the direction of Ostende, keep in 4 to 3½ fathoms water at about 1½ miles off shore, until Bruges steeples appear in line with Blankenberghe, and then steer N.E. by E. northerly towards the Wielingen light-vessel.

At the anchorage called the Schooneveld in the offing abreast Wielingen channel there are from 4½ to 9 fathoms water, on good holding ground. Ships proceeding westward of the Schooneveld bank, for Wielingen channel, may anchor in 5 or 5½ fathoms, with West Kapelle bearing East, and Bruges steeples about midway between Blankenberghe and Lissewege steeples, about S. ¼ W.

TIDES at ENTRANCE of SCHELDE.*—At Blankenberghe it is high water, full and change, at 0h. 15m., at Flushing and Veere at about 0h. 54m., and at Antwerp at 4h. 25m.

The average rise of the water on the quarter days at Flushing is 11 feet, and at spring tides 15 feet; but it is so much affected by the strength and duration of different winds, acting on the two great streams which come through the English channel and round the north of Scotland, that no satisfactory results have yet been deduced from the registers of the rise and fall, though they have been carefully observed.

Without any material error, however, the rise of the water, at ordinary tides, may be stated thus:—

	Rise.			Fall.	
	ft.	in.		ft.	in.
During the 1st hour of flood	- 0	11	During the 1st hour of ebb	- 0	10
" 2nd "	- 1	3	" 2nd "	- 1	7
" 3rd "	- 1	7	" 3rd "	- 2	4
" 4th "	- 2	3	" 4th "	- 2	10
" 5th "	- 4	0	" 5th "	- 2	7
" 6th "	- 1	10	" 6th "	- 1	8

From this it appears that the greatest rise occurs at the 5th hour, and the greatest fall at the 4th hour.

On this part of the coast the phenomena of the tides are very irregular, when compared with what has been observed farther north on the Dutch coast; here, for instance, they revolve in a direction opposite to the sun, whereas to the northward of the Oude Steen bank of Goeree they follow its course. The different directions which the tides take from hour to hour, are, nevertheless, of such importance to a vessel running in among the banks, or making for a harbour (the reaching or not reaching of which may entirely depend on this knowledge), that a concise description of them will here be given.

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* From observations by Captain A. R. Blommendal, of the Dutch Navy.

In order to have a general point of reference, the time of high water at Flushing will be found the best adapted for the purpose. By reckoning in the usual manner, it may be ascertained how many hours have elapsed since the last high water there at the time designated.

Outside the banks, in the open sea, the general flood-stream runs E.N.E., and the ebb W.S.W. There, as well as outside the gats, or entrances to the channels, the after-flood, as it is called, begins two hours before it is high water at Flushing, and runs about E.S.E. for the Walcheren coast, until it is high water. The stream then bends away from the coast, so that, at one hour after high water, it will have a N.E. direction; at two hours after high water at Flushing it will run N.N.E.; and at the third hour after high water, or at half-ebb at Flushing, North. The rotation then accelerates till the fourth hour, when it attains a W.N.W. direction, at which time it is said to be low water at sea.

During the following two hours, that is, till the time of low water at Flushing, it is slack water on the Steen bank and off the gats, and the stream runs W.S.W.; so that from the beginning of the ebb at sea, until the next spring tide, the stream will have varied in direction 16 points of the compass against the sun.

With the flowing tide the rotation follows the same order, so that at the seventh hour after high water (always at Flushing) the stream runs S.W.; at the eighth, S.S.W.; at the ninth, South; at the tenth, E.S.E.; at the eleventh, East; and at the twelfth hour, or second high water, E.N.E. again; having thus, during the six hours of the flood, run successively towards the remaining 16 points of the compass against the sun; so that a vessel at anchor, in a calm, would, in the course of the ebb and flood tides, have had her head turned to all the points of the compass; but it is proper to remark that the stream changes its direction quickest near the entrance of the gats.

Though the same rotary movement takes place on the Steen bank, yet just within it, in Steen deep, the tide streams run more regularly, preserving an E.N.E. and W.S.W. direction, with an interval of slack water between them; which is not the case with the above revolving streams, as they continue to run without intermission.*

WIELINGEN CHANNEL, or French pass, is an excellent channel, and by far the best passage into the Schelde. It is bounded, as before noticed (page 96), by the Blankenberghe flats to the southward until they fall in with the north shore of Kadzand island, and to the northward by the Rib zand and Hompel. The channel, therefore, may be said to begin abreast Blankenberghe, and to run in an E. by S. direction, about 18 miles to Flushing. Its breadth is generally 1¼ miles, and it has nowhere in mid-channel less than 4¾ fathoms, which depth will also be found by keeping the leading marks on, in the entrance. Proceeding inwards the water increases in depth, and throughout its whole extent the channel has soft ground. On the Paarde-markt and Kadzand banks there are 28 and 26 feet water.

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* *See* Tidal diagrams on Admiralty chart:—Entrance of the Schelde to Antwerp, No. 120.

TIDES in the WIELINGEN.—Here the fore-flood runs inshore in a southerly direction, as the finished ebb bends round against the sun; and is, at times, so strong, that ships entering close-hauled on the port tack are frequently obliged to anchor on account of it, until the stream runs inward in the direction of the channel, which, as before stated, takes place much earlier than at sea.

The water attains its utmost height at Flushing nearly an hour before the stream has done running up, so that it is more than one hour after high water at that place, before the ebb begins regularly to run down to the different gats. It then runs in a W.N.W. direction to the Wielingen, uniting with the ebb which runs out from before Hoofdplaat in a northwest direction. When as far as the Walvisch-staart bank the ebb stream runs more seaward, from W.N.W. to N.W., falling over that bank, and the earlier the time the more northerly its direction; it is the same over the Hompel and Rib zand, farther down in the Wielingen.

With southerly winds this northern set of the ebb must be attended to carefully when passing the Kadzand, and the Paarde-markt, especially when sailing by the wind out of this channel. The northern tendency of the tide continues until it is low water in the gat, when the stream runs fairly out of the Wielingen; but soon after turns inward toward the shore, as far as S.W., and runs still longer farther to the westward; so that, west of the Sluissche gat, it ebbs one hour before, Heist two hours, and off Blankenberghe three hours longer than at Flushing, thus affording outward-bound ships the advantage of always having long ebbs.

On comparing this longer running of the ebb before Blankenberghe than before Flushing, with the circumstance of high water occurring earlier at the former place than the latter, and, consequently, also low water, there seems to be a discordancy, which can only be explained by the rotary motion of the tides; thus, when it is low water at Flushing, or six hours after high water, the stream runs W.S.W.; at the seventh hour, S.W.; at the eighth, S.S.W.; and at the ninth, South; when it may be considered that the tide is just beginning to run in, although the depth of water has been increasing for nearly three hours. The farther inward the more the banks interfere with the rotation, and, therefore, the more directly the streams run.

DIRECTIONS through WIELINGEN CHANNEL. —Having arrived near the Wielingen channel, vessels of great draught should bring Bruges steeples on with Lucifer duin S. ¾ E.; this will lead to the outer buoy, and thence E.S.E. 2¾ miles until the light-vessel bears North one third of a mile distant. The course will then be East for 2 miles until on the line of Nieuwe Sluis lighthouses, the light-vessel bearing W. by N. nearly; from this position the lighthouses kept in line bearing E. by S. for 9½ miles lead through the channel to French pass between Hompel and Kadzand island, in not less than 4¾ fathoms water. This course leaves in succession all the black buoys upon the port hand, and the white buoy with the white and red striped buoy which mark Binnen Paarde-markt on the starboard hand. When west Nieuwe Sluis lighthouse bears S.W. by S. steer about E. by N. ½ N. 2 miles for Flushing lighthouse, when an East course may be shaped for the road. A leading mark through the pass up to the sixth black buoy is, Orange mill in line with Flushing lighthouse E. ½ N., or the steeple of Ritthem, with a large tree close to it, showing a little to the southward of that of Flushing on the same bearing, when after rounding the buoy No. 7, an E. ¼ N. course made good for 3¼ miles will lead to the southward of the white buoy at the inner spit of the Elboog, and up to Flushing road.

Should the buoys be removed, a vessel running in with the marks just given, may be certain of being abreast the east end of the Hompel, when West Kapelle, in Walcheren, is approaching the eastern base of the Zaalduin, N. ½ E.

When Groede steeple bears S.W. ½ S., you will be nearing the position of the buoy at the point of the Elboog, page 99, whence an E. by S. ½ S. course for 1½ miles, or until Middelburg spire is in line with the east side of Flushing N.E. by N., leads into Flushing road, where there is anchorage in 9 and 10 fathoms, to the south-eastward of the town.

To enter Wielingen channel from sea, across the flat between the Schooneveld bank and the ridge of the Raan, as well as the Spleet channel and Rib zand, the leading mark is Westkapelle (Belgium) tower on with Knocke steeple S. ¼ E. With this mark there will be found on the great flat from 3½ to 4¼ fathoms. Keep the lead going quickly, and when the depth increases to the latter, the vessel will be in the Spleet channel. The same mark will lead across the Rib zand between the Bol van Heist and the Bon van Knocke in 27 feet at low water, hard ground, to soft mud in Wielingen channel, when the former directions must be followed.

The Rib zand may also be crossed between the Bon van Knocke, and the Carolus bank, (the west end of the Hompel,) with Bruges steeples well open east of that of Knocke, S.W. ¾ S.; this leads in 26 feet at low water over hard sand, but the passage is very narrow, and near, westward of No. 4 black buoy.

These marks for crossing the Rib zand are principally given here for a vessel which may unintentionally have gotten into the Spleet by mistake in dark weather. This might happen by passing over the point of Schooneveld bank, having mistaken it for the Rib zand, and finding in the Spleet a soft bottom, similar to that in the Wielingen; and a vessel might sail eastward a considerable way in the Spleet, which is wide, before she would discover the mistake, and ultimately get aground on the northern part of the Walvisch-staart.

At night, the east end of the Hompel will be cleared on opening the red light on the Kadzand shore on the bearing of S.W. by S.

Turning through.—In working up the Wielingen, no marks can be given, but the soundings are tolerably regular, and after passing No. 3 perch buoy both sides may generally be approached to the depth of 5½ fathoms; special caution, however, is necessary on the side of the Bol van Knocke and Hompel, for the latter is steep-to.

In the pass between the Hompel and Kadzand island stand towards the Hompel till Orange mill and Flushing lighthouse are in line, E. ¼ N., or till between Nos. 6 and 7 buoys. When through, both sides may then be closed to the depth of 5½ fathoms, until Middelburg spire is in line with the east bastion of Flushing N.E. ½ N., which is the mark to run into Flushing road.

SPLEET CHANNEL lies between the Schooneveld bank and the ridge of the Raan and Walvisch-staart, on the north side, and the Rib zand, and the Hompel on the south side. The entrance abreast the west end of the Rib zand is about 1½ miles wide, between the depth of 4 fathoms on each side, and there is little above that depth in mid-channel on soft ground, until near the Walvisch-staart, when having passed between the spits from Rann and the Rib zand, the channel changes its direction more easterly, and becomes deeper. The south side is steep opposite the Bols on the Rib zand, but the north side may be approached to 3 fathoms water until as far advanced as the Walvisch-staart, where the sides are irregular and broken.

DIRECTIONS through the SPLEET.—The Spleet channel is circuitous and unbuoyed, and although wide and deep with soft bottom as far up as the Rann spit, it is seldom used by vessels, except those intending to cross the Rib zand into Wielingen channel, as stated in page 105. Approaching the Walvisch-staart the channel becomes narrower, and the banks on each side beyond the spit are steep.

The leading mark through, from a position a little to the northward of the outer buoy of the Wielingen channel, is Middelburg spire in line with the northernmost of three sand-hills named the Kaapduinen, bearing East. Having with this mark passed through the Spleet to as far as the Walvisch-staart, or until Kadzand church bears, with the mill, S.E. by S. ¾ S. steer about 1½ miles with Groede spire bearing S.E. ¼ E., and enter the deep between the Walvisch and the Hompel, both sand edges of which are steep-to, and the course up is E. by S. ½ S.

DEURLOO CHANNEL.—The Deurloo channel is bounded by the Raan and Elboog to the south-west, and by the Rassen and Zoutelande banks, and shore of Walcheren to the north-east.

Of the buoyed entrances to the Schelde the Deurloo may be considered the most difficult, partly from the great extent of the shallow banks on both sides, as well as from the great distance of the landmarks; secondly, on account of the flat which lies across its mouth, called the Drempel or bar, outside which vessels of large draught always wait till half-flood before they pass it; and, thirdly, because the early tide running southerly, and not directly into the Deurloo till two hours before high water, in might set them on the Raan.

The Drempel, or bar before the Deurloo, as well as the bottom in the middle of the channel, is hard; but the margins of both the Raan and Rassen consist of soft clay. This bar or flat is of considerable breadth, but, except in one place of 17 feet, in the channel there is nowhere less than 3½ or 3¾ fathoms. When West Kapelle church is open north of the west mill bearing E. ¾ S., the bar may be considered as passed.

Within the bar the depth is from 3½ to 4¼ fathoms to abreast the inner end of the Rassen, and the breadth averages a mile; 5, 7, and 8 fathoms are the depths between the Elboog and Zoutelande bank, increasing towards Flushing. All that part of the Elboog which dries is steep-to.

TIDES in the DEURLOO.—Outside the Deurloo channel the rotary movement of the tides takes place as already described in page 102. A laden ship wanting to get into this channel with northerly winds, should wait at least till nearly half-tide, or 9 hours after the last high water at Flushing; because the first of the flood runs strongly round to the south, and it is only 2 hours before high water at Flushing that the flowing tide runs straight into the Deurloo.

This difference in the course of the tide is the reason why ships sailing with the ebb, under a press of sail from the Deurloo, can profit by that ebb no longer than 4, or, at the utmost, 5 hours; as the tide, continuing its rotary motion, will then again be running to the south-west, and setting direct upon the Raan.

The ebb runs from Flushing road to the Deurloo, N.W. and N.N.W., at first following the direction of the banks, to as far as between the Elboog and Zoutelande bank; but there, when the water has been falling 2 hours at Flushing, the ebb assumes a more northerly direction, as it does in the Wieliegen, and sets over the bank of Zoutelande and the Rassen, till it is low water in the Deurloo; when the tide begins to run nearly west, and so changes about to the south. But, contrary to what takes place in the Wielingen, where, the farther to the westward, the longer the water ebbs, here it will be low water at the outer buoy of the Deurloo one hour earlier than at Flushing.

DIRECTIONS through the DEURLOO.—In approaching the Deurloo channel from seaward, the following bearings of West Kapelle church lead clear of the offing shoals:—E. by S. ½ S. to the southward of the Thornton ridge; S.E. by E. ¼ E. between the Thornton ridge and the Rabs; and S.E. ¼ E. between the Rabs and Steen banks. Keep one or other of these bearings on until Bruges steeples have been brought nearly in line with Heist church, and it will lead to the outer buoy of the Deurloo.

If approaching from the south-westward, keep in 7 or 8 fathoms water upon the outer edge of the Raan, while nearing the outer buoy.

Directions for reaching the outer buoy of the Deurloo by the lead, when the land cannot be seen, would be given were it not that they would rather tend to confuse the seaman, than to give him confidence. Without that thorough knowledge of the depths and nature of the soundings, which none but experienced pilots can possess, no person should make free with those banks, unless the marks on shore can be distinctly seen.

With Bruges steeples in line with Heist, S. by W. ¾ W., and Middelburg church open north of Walcherensduinen S.E. by E. ¼ E., or Oost Kapelle and Domburg steeples in line E. by S. ¼ S., a vessel will be in a position one mile, N.N.W., from the situation of the red or fairway buoy; which, should it be necessary to wait for the flowing tide, is a good place to anchor. If hove to, for that purpose, keep Middelburg spire open to the southward of West Kapelle church, S.E. by E.

From the red fairway buoy steer S. by E. ½ E. past the black buoy on the 17-feet shoal of the Drempel or bar, when the course will be more easterly between the white buoys of the Raan and Elboog and the black buoys of the Rassen. The bar has been passed when Domburg steeple appears on with the Koeduin, E. ½ N.; the course will then be S.E. ½ E. until Zoutelande appears in the slob or valley between the sand-hills, and then more easterly; but if the weather be clear, Orange mill at Flushing kept in line with the white part of the town wall, S.E. ⅓ E., is a good leading mark for the whole of the Deurloo channel, until within half a mile of the shore of Walcheren, passing, however, rather close to Nos. 4 black and 5 white buoys, or until Middelburg spire has passed the Galgeschaar, E. by N. ¾ N., when a course must be steered along shore towards

Flushing road, passing between the remaining white buoys upon the Elboog, and a black buoy lying at the outer end of Nolle plaat, a spit from the shore to the north-west of Flushing. *See* page 101.

Should the buoys of the Deurloo have been removed, then close West Kapelle on an E. by S. bearing; cross the north end of the Raan in 20 feet at low water, and, when Orange mill has been brought in line with the white part of the town wall of Flushing, S.E. $\frac{1}{3}$ E., proceed as before directed.

Turning through.—In working through the Deurloo, stand to the north-east side, until Orange mill appears to touch a little steeple, situated just to the south of the great mill at Flushing; and to the south-west side till Orange mill has been brought against the broad steeple of the barrack; but farther in, in order to avoid the north-east part of the Elboog, another little steeple, situated to the eastward of the great one (and therefore always seen to the northward of it) must not be brought on the south side of the new or western mill at Flushing. The north-east side of the Elboog is steep, and a vessel, when standing towards it, should tack when West Kapelle mill begins to appear over Walcheren duin; it is not advisable to follow these directions without great caution and constant use of the lead.

From the red buoy on the south-east point of the Zoutelande bank, the Walcheren coast is clear, and may be approached by the lead up to Flushing, taking care to avoid the Nolle plaat just described as projecting from the shore to the north-west of the town, on which is a black buoy.

OOST or EAST GAT, which enters between the Caloo and the Kneerens banks, is the easiest channel to sail in through, if necessary without a pilot, especially with northerly winds. The marks may generally be seen distinctly; and the course is straight, until, rounding the point of West Kapelle, it changes from South to S.E. by S. between the Zoutelande bank and the shore of Walcheren.

On the flat at the entrance there is from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms of water, and the red buoy (p. 100) lies on the east side of the channel. When Oost Kapelle steeple approaches that of Domburg the water will deepen to 5 and 6, and off the point of West Kapelle to 9 or 10 fathoms. It is flat for a short distance off West Kapelle mill, and a little to the northward of it, and also round the point opposite Walcheren duin. The channel here becomes narrow, in some parts not exceeding a third of a mile; but the depth will increase from 10 to 12 fathoms, and again decrease to 7 and $5\frac{1}{2}$ fathoms to the southward of Zoutelande, and both sides are steep-to.

TIDES in the EAST GAT.—In the East gat, off West Kapelle, the tide streams revolve in every respect the same as they have been stated to do at sea; and above the mill of West Kapelle, the first of flood, and the flood in general, runs about south. The flood, or rather the entering of the water, on the north side of the West Kapelle dike, or near the Kaaphuisje, begins 2 hours before it is low water at Flushing; while on the opposite side of the gat, by the Rassen, the ebb stream, at low water, runs west and west-south-west. From Flushing road to near the corner of the dike, and on to West Kapelle mill, the ebb follows the direction of the coast, but always inclining towards the shore, as if pushed in by the Deurloo ebb, which sets over the bank of Zoutelande; the reverse prevails with the flood, which, from West Kapelle mill inwards, recedes from the strand, and runs southerly.

Respecting the general features of the Schelde tides, it is to be remarked, that the ebb, which runs down the Schelde, and that which comes through the Sloe, and passes over the Kaloot bank, unite off Flushing. Below that town, where the shores diverge on either side in the shape of a funnel, the stream passes into various channels, which advance towards the different gats; while on the intermediate banks, the stream diminishes in strength in proportion to their lesser depth, and consequently accelerates in the channels.

DIRECTIONS.—To sail into the Oost (East) gat from the Steen deep, page 120, bring Middelburg spire in line with Domburg church S.E. by S. ¼ S., and keep it so till West Kapelle lighthouses are in line bearing S. ¾ E. Keep on this course until Kueerens red buoy bears about S.E. by E. distant one mile (page 121). Steer from thence so as to pass at about a cable's length from the point of West Kapelle, until West Kapelle lighthouse and mill are in line. If the weather be clear, Groede steeple kept open of, but close to West Kapelle point, South, will lead over the flat of the Caloo a mile to the westward of the red buoy, and up to West Kapelle point, observing to open the mark in advancing in order to be at the above-stated distance when the tower and mill appear in line. The course will now be about S.E. by S. southerly and on the line of the two light towers of Kaapduinen, until on that of the lighthouses of West Kapelle and Zoutlande on a N. by W. ½ W. bearing, then steer on this line S. by E. ½ E. along by the coast, with the lead going, and taking the soundings from the shore side until the outer lighthouses of Kaapduinen are in line bearing N. ¼ W., a S. ¼ E. course will then lead between the black buoy of Nolle plaat and the S.E. white buoy of Elboog.

At Night.—Coming from seaward for the entrance of the Oost gat, vessels should keep the two West Kapelle lights in line bearing S. ¾ E., which will lead between the Steen banks in 25 feet water, and through the East gat whilst crossing the *red* sector of Domburg light; but on Domburg light changing to white, the course must be altered and made parallel to the dike until the leading lights of Kaapduinen are in line S.E. by S., keep them so until Zoutelande light is in a line with the West Kapelle light; when just past Kaapduinen, quit the line of the leading lights of Zoutelande and West Kapelle, and bring the Kaapduinen lights in line N. ¼ W., keeping them so until the high light at Vlissingen (Flushing) changes from *red* to white; the Nolle plaat is then passed, and the roadstead may be steered for.

Turning through.—In order to avoid the north side of the Caloo, Oost Kapelle steeple must not be brought to the southward of the Oosteroog S.E. by E. ¾ E.; and to clear the Kueerens, West Kapelle must not be brought to bear westward of South.

A vessel will be to the westward of the Kueerens while East gat light to the north of West Kapelle is not obscured, which it is when brought to bear westward of S. by W.

After getting within the flat ground at the entrance, a vessel may stand eastward till West Kapelle mill bears S. by W. ¼ W., observing to keep the mill clear to the westward of everything seen on West Kapelle dike; and stand to the westward, until Groede steeple appears over the western half of the wood of Wulpen, but not farther; and that only till Middelburg spire opens to the southward of West Kapelle mill, for beyond that it would lead too near the north-east part of the Rassen. Here another mark presents itself to clear that bank, namely, Flushing steeple, which will show through Dishoek gap, S.E. by S.; therefore tack as soon as it is seen.

When standing towards the Zoutelande bank, attention must be paid to the stream ripple always found there, and the vessel be put about in time to avoid it. None but small vessels should attempt to work through this narrow channel by night, for their only guide will then be the quality of the bottom, which is very soft in mid-channel, but hard sand on approaching either the shore or Zoutelande bank, so that it will be necessary to tack immediately the change occurs. As the high duins might mislead in estimating the distance, it is at all times advisable to keep as much as possible the shore side, being steep-to, and also because the flood tide, with which vessels go in, always sets more or less from the shore over the Zoutelande bank.

From the red buoy on the Zoutelande bank to Flushing, proceed as directed for working into the Deurloo, *see* page 109.

FLUSHING ROAD lies between the town and the western point of the Kaloot bank, and affords good anchorage in 9 or 10 fathoms, but in some parts there are 16 fathoms; and gales of wind from the westward send in a heavy sea, which compels ships to seek shelter higher up the river.

Vessels of small draught may find good and safe riding in Rammekens road, 2 miles eastward of Flushing, between the north-west side of the Kaloot and the shore. To enter it, keep to the northward of the red buoy marking the spit of the sand, and anchor in 4½ to 5 fathoms at a distance of a cable to half a cable from the shore. Large vessels must run up to the river, and seek shelter before Terneuse. The West mill kept between the two towers leads close to the northward of Spijker plaat; in approaching the Kaloot keep the ruins of a church in Flushing, on which are the remains of a telegraph but no steeple, in sight open to the south of Orange mill until the great steeple at Flushing comes between the two mills (Orange mill being on the south side) which is the leading mark through De Honte; after which there are no good marks, the buoys and the lead being the best guides. By night, having passed to the northward of Spijker plaat steer about S.E. ¼ E. with Borsele light a little on the port bow, and keep to the southward of the red section of the light until the two lights at Nieuwe Neuzen are in line bearing S. by E. ½ E., keep on this course, and when Terneuse light changes from white to red at once alter course to about S.E. ½ E. so as to bring the white light in sight again which will lead up to Terneuse.

LIGHTS.—Borsele point, 5¾ miles S.E. by E. from Flushing, at the height of 35 feet above high water, is exhibited a *fixed* light, visible at 9 miles. The light shows *red* when bearing to the southward of S.E. by E. and *white* when bearing eastward of S.E. by E. At Breskens, opposite Flushing, a *fixed* white light is shown from each end of the breakwater.

Terneuse.—At Nieuwe Neuzen are two *fixed* white lights, on the bank of the outer dyke bearing from each other N. by W. ½ W. and S. by E. ½ E. distant 330 yards; the north light is elevated 17 feet and the south light 32 feet above high water, and should be seen respectively 8 and 10 miles.

At Terneuse west jetty, at the height of 43 feet above high water, is a *fixed* light, showing *red* when bearing eastward of S.E. by E. ½ E., and white to the southward of that bearing. The light should be seen 8 miles.

Eendragt.—Three *fixed* white lights. One of these lights is on the sea bank, and the other two a short distance behind and on either side of it. The centre light is visible from the river through an arc of 180 degrees, the East light from E. by N. ¼ N., through east and south to S. by W. ¾ W.; and the West light from E.S.E. through south to S.W. by W. ⅔ W. The East light bears E. ⅓ S. distant 335 yards, and the West light S.W. ⅔ S. 370 yards from the centre light. The centre light is elevated 16 feet, the East light 32 feet, and the West light 34 feet above the level of high water. The centre and East lights in line, lead in the fairway towards Terneuse, and the centre and West lights in line lead in the fairway to the northward.

Baarland.—A *fixed* light on the point, visible 9 miles, shows *red* when bearing southward of S.W., and white westward of S.W.

Biezelingsche-ham, on point, a *fixed* white light, 13 feet above the sea, and visible between the bearings of N.E. and S.W.

A second *fixed* white light has been established at Biezelingsche-ham, bearing N. by E. distant 590 yards from the ordinary light, it is visible between the bearings of N.E. by N. and N. by W., and is elevated 39 feet above high water.

Hanswest.—On west side of entrance to canal, a *fixed* light, *red* when bearing south of E.S.E., and white when bearing east of E.S.E.

Magere Merrie.—A *fixed* white light has been established at Magere Merrie, bearing N.W. ¾ W. nearly half a mile from Welsoorde light. It is elevated 50 feet above high water, and visible 8 miles.

Welsoorde, 82 yards within the end of the dyke north of Welsoorde, is a *fixed* white light at 30 feet above the water, and visible for a distance of 10 miles.

Groenendyk.—Two *fixed* lights, east of Groenendyk ; bearing from each other E. by S. and W. and N. distant 756 yards. The East light is on the sea bank, and the other on the inner bank of the outer dyke. The East light is white and *red*, showing red from W. by S. to W. ¼ S., and white from W. ¼ S. to N.W. by W. ; it is elevated 17 feet above high water. The West light is white, and is visible from N.W. by W. ¼ W. to W. ¼ S. ; it is elevated 36 feet above high water.

Rilland.—Two *fixed* lights bearing from each other N.N.W. ½ W. and S.S.E. ½ E. distant 220 yards. The North light is white, elevated 27 feet above high water. The South light shows *red* when bearing eastward of North, and white when bearing westward of North ; it is elevated 14 feet above high water.

Bath.—Two *fixed* lights bearing from each other N.E. by E. ¼ E. and S.W. by W. ¼ W. The East light is white, elevated 38 feet above high water. The West light shows *red* when bearing eastward of N.E. by N., and white when bearing northward of N.E. by N. ; it is elevated 23 feet above high water.

Frederik lights.—Two lights : the northern light is a *fixed* light, visible 8 miles, showing *red* between the bearings of North and E. by S. ⅔ S., and white between E. by S. ⅔ S., and South, the light is exhibited from a house close to the dyke of the old fort, 194 yards N.N.W. ⅓ W. from the southern light, and elevated 20 feet above high water. The southern light is white, and visible between the bearings of S. ½ E. and S.E. ½ E. in clear weather for 10 miles.

Doel light is *fixed*, showing *red* between the bearings S. ½ W. and S. by W. ½ W., and white between S. by W. ½ W. round by west to N. ½ E.; it is exhibited from a house at the jetty, and elevated 15 feet above high water, and is visible 8 miles.

Liefkenshoek is a *fixed* white light, exhibited from a house near the landing-place of Liefkenshoek fort; it is elevated 16 feet above the level of high water, visible 5 miles.

Kruisschans is a *fixed* white light, exhibited from a house close to the dyke of the Poldor of Oordam, and 200 yards above the ruin of Fort de la Croix; it is elevated 16 feet above the level of high water, visible 5 miles.*

DIRECTIONS.—Vessels from the southward must keep the two Rilland lights in line until the most westerly light at Bath changes from red to white, when the line of the two lights must be left, and those of Bath brought in line to proceed through the Bath narrows. Vessels from the south-west must keep the Bath lights in line until the northern Rilland light changes from red to white, near the white buoy marking the elbow of the Saeftinge plaat, when the Rilland lights must be brought gradually in line and kept so in proceeding towards Doel light.

Vessels proceeding down the river from Doel at night must keep within the white sector of Doel light, and when Frederik northern light changes from red to white, keep the two Frederik lights in line until the leading lights of Rilland come in line, near Saeftinge. When proceeding up the river from Saeftinge, the Frederik lights must be kept in line until Doel light changes from red to white, when the course must be altered so as to keep in the white sector of Doel light.

Terneuse is connected with Ghent by a canal with entrance gates 40 feet wide, for vessels of 600 tons to pass through and unload in the basin of that city. There is also a railway to Huist.

ANTWERP, the chief port of Belgium, is upon the right bank of the Schelde, 12 miles above its estuary, and 50 miles from the sea. The city is strongly fortified on the land side, and its citadel to the south, built by the Duke of Alva in 1567, is considered one of the most complete works of that character. The latter was bombarded by the French in 1832, the King of Holland having refused to give it up on the severance of Belgium from his kingdom, and was obstinately defended for nearly a month. The numerous public buildings of Antwerp, chief among which is its celebrated cathedral, and the general style of its architecture, gives a highly picturesque appearance to the city. The quay along the Schelde is spacious; at its north end are the basins constructed by Napoleon; the area of the great basin is 17 acres, and of the small one 7 acres; they are now used for commercial purposes, and are lined by capacious warehouses.

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* Besides these lights the navigation of the Schelde is further assisted by several buoys.

Trade.—The trade of Antwerp is extensive; the exports consist chiefly of hides, flax, cotton and linen, manufactured goods, &c., and the imports of hides, coffee, sugar, cotton stuffs, and other manufactures, a large proportion of the latter being forwarded to various parts by means of canals and railways. In 1875, 4,267 vessels with a tonnage of 2,146,797 tons, arrived at Antwerp, of which vessels 2,247, with a tonnage of 1,307,747, were British. The passenger traffic is also very considerable; it is carried on by numerous steam-vessels, of which several ply between Antwerp and Hull and London. Taking the average of the last five years, the value of the merchandise imported from and exported to the United Kingdom vastly exceeds that received from or sent to any other country by sea. Antwerp has, moreover, become an important point of embarkation for emigrants. The population in 1876, including the suburbs of Berchem and Borgherout, may be estimated at 200,000.

Docks.—The following are the dimensions of docks at Antwerp:—

Dry docks: No. 1, length over all, 360 feet; breadth of entrance, 81 feet; depth over sill, 20¾ feet. No. 2, length over all, 196 feet; breadth of entrance, 39 feet; depth over sill, 11¾ feet. No. 3, length over all, 134 feet; breadth of entrance, 32 feet; depth over sill, 7½ feet.

Floating docks: Old, breadth of entrance, 54 feet; depth over sill, 22 feet. New, breadth of entrance, 82 feet; depth over sill, 24 feet.

There is also a gridiron with 9 feet water.

CHAPTER V.

THE SCHELDE TO GOEREE.

Variation, 16° 51′ West in 1878.
(Decreasing 9′ annually.)

The EAST SCHELDE, after separating at the head of the estuary from the West Schelde, passes along the north-east side of South and North Beveland islands, and joins the sea from between the islands Walcheren and Schouwen by an outlet encumbered by dangerous and extensive sands, through which there are two channels, the main one being named the Roompot.*

The entrance to the East Schelde has little to distinguish it except the lighthouses on either side. From West Kapelle, the north-west side of Walcheren, trending north-easterly, is skirted by moderately high sand hills, upon which are several signal stations and a marine residence, while a short distance behind, appear the churches of Domburg and Oost Kapelle. The former has a small tower surmounted by a spire; the latter has a broader tower and a shorter spire. Eight miles to the eastward of West Kapelle, at Veere gat, the shore of Walcheren trends southerly to Veere, or Ter Veer, the church of which place is distinguished by a dome. From every direction at a short distance off the island of Walcheren the noble spire of Middelburg shows well above all the other objects, and consequently forms an excellent sea-mark. The shore of North Beveland, trending E.S.E. from Veere gat, is low, with some wood here and there.

Middelburg haven has its outlet a mile to the southward of Veere, and though of considerable size, is smaller than it was formerly. A few vessels are built here, but its trade is very limited.

Schouwen island, on the opposite side of the East Schelde, has at its north-west end many sand-hills, some of which, named the Woolpacks, are long and white; the others appear as green hummocks. Among them stands the prominent object, Schouwen lighthouse, described at page 132, and, in clear weather, the massive tower of Zierikzee church, at the south end of the island, may, from its superior magnitude, be seen at a considerable distance off.

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* *See* Admiralty charts:—River Schelde from the sea to Antwerp, No. 120; and Mouths of the Maas, No. 122; scales, $m = 1 \cdot 0$ inch.

Zierikzee, noted for its oysters, of which large quantities are exported, is connected with the East Schelde by a canal 1½ miles long and running straight in a W.S.W. direction. The town has a small shipping trade, but the chief employment of the place is the production of madder; the manufacture of garancine was begun in 1847. (*See* page 125.)

LIGHTS.—On Oosterhoofd sand-hill, north side of Walcheren island, a *fixed red* light is exhibited at an elevation of 33 feet above the level of high water, and should be visible from seaward and over Roompot in clear weather through an arc of 180°, between the bearings of E.N.E. and W.S.W., from a distance of 4 miles.

Veere is a *fixed* white light of the fourth order, shown from the Kampveer tower at south side of entrance; it is elevated 38 feet above high water, and visible in clear weather at 10 miles north-eastward, between the bearings of N.W. ½ N. and S. ½ E.

At Wulpenburg another *fixed* white light is shown to the southward of the entrance of Middelburg haven, at 33 feet above high water, and visible 4 miles eastward, from S. by E. to N.N.W., or from the Sloe channel to Veere gat.

Zierikzee is a small *fixed* white light, 43 feet above high water, and visible at 5 miles; it is shown from a house upon the west pier of the harbour, which is seen in the road and channel to it.

About 1¼ miles eastward of the latter is a *fixed* light 31 feet above high water, which shows *red* when bearing eastward of N.E. ½ E., and visible at 4 miles from a south direction between East and West.

At the south side of the entrance to Zand kreek a *fixed* light is shown at 32 feet above high water, and visible for 10 miles.

At Wemeldinge, on the jetty west of the South Beveland canal, a *fixed* white light is exhibited.

Gorishoek light near the ferry, is a *fixed* white light shown from a height of 35 feet above high water, and visible 4 miles.

Stavenise *fixed* white light on the south side of the western entrance of Keeten Mastgat from the Eastern mole head, is 35 feet above high water, and visible 11 miles.

RABS SHOAL.—Several sands, lying in a direction parallel to the shore, and in front of the entrance to the East Schelde and Brouwershaven gat, extend north-eastward from near Thornton ridge. The first in continuation from the latter shoal is the Rabs, or Wascels Rabs, a broad cluster of sandy knolls, which lie equally in the way of vessels bound to the West Schelde through the Deurloo channel and East gat, or to the East Schelde. The line of 10 fathoms around the Rabs embraces a space [illegible] miles long in a N.E. by E. and S.W. by W. direction and 2½ miles broad; the shallowest water being near the centre, where, over a square mile, the depth is from a little less to a little more than 4 fathoms.

[illegible] the centre of the shoal is marked by Middelburg spire and West Kapelle light-tower being in line S.E. ¼ E. 15 miles from the latter, and in the horizon [illegible] Bruges steeples will be seen just to the southward of Lisseweghe steeple S. by W. From near the centre of the Rabs the shoal on the north-east extremity of Thornton ridge bears about West [illegible] miles.

West Kapelle S.E. leads in 7 fathoms across the north-east end of the Rabs. Middelburg spire, open a distance equal to thrice its apparent length to the south-east of West Kapelle S.E. by E., just clears the shoal on the south side.

At night, West Kapelle light S.E. by E. ½ E. leads between the Thornton ridge and the Rabs, in 8 fathoms water.*

The SCHAR, 3 miles outside the north-east end of the Rabs, is a narrow ridge 5 miles long in an E. by N. and W. by S. direction, with 6 to 7 fathoms water upon it. There are also several deep water ridges of a similar character farther out between the Schar and the Hinders banks.

SCHOUWEN BANK is nearly in continuation of the Schar to the north-eastward, and is opposite to Brouwershaven gat rather than the East Scheldt. There are several small ridges nearly in connexion with this bank; but the latter, taken within the 10-fathoms line, is a ridge 15 miles long in an E.N.E. and W.S.W. direction, and one mile broad, with the shallowest portions, patches of 4 fathoms, about the middle and the west end of the shoal; the prevailing depths over the other parts are 6 and 7 fathoms. From the depths of 4 fathoms upon its west end, Schouwen lighthouse bears E.S.E. 15 miles; and from the same depth towards its east end, the lighthouse is S.E. ½ S. 11½ miles. There are 13 fathoms water close to Schouwen bank on both sides.

A series of ridges, with 8 to 6 fathoms upon them, extend north-eastward of the Schouwen bank to abreast Brielle bar, but their disconnected character prevents any special description being given of them. One patch (the shallowest) of 5 fathoms, lies East 5 miles from the east end of the shoal portion of the Schouwen bank. *See* page 137.

Bell Beacon Vessel.—An iron bell beacon vessel has been placed in the position formerly occupied by a red conical buoy near the north-east shoal part of the Schouwen bank. The vessel is painted black, and has one mast, to which is secured a triangular frame-work extending fore-and-aft and athwart, having planks painted alternately black and white.

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* See Admiralty chart, North sea, No. 1,406; scale $m = 0 \cdot 3$ of an inch.

On a black plank is *Schouwen bank*, and on one of the white planks *W. Schouwen, S.E. magnetic.* A heavy bell, the sound of which serves as a warning by night or in foggy weather, is carried at the mast head at an elevation of 23 feet above the water, and the whole may be seen in clear weather from a distance of 8 miles. The beacon vessel lies in 14 fathoms at low water, in lat. 51° 47′ N., long. 3° 28′ E., with Schouwen revolving light bearing S.E., and West Kapelle lighthouse S. by W. ¾ W.

MIDDEL BANK, 2 miles within the Schouwen bank, the channel between having 15 to 17 fathoms in it, is in continuation of the Rabs to the north-eastward, and lies across the entrance of the East Schelde, as it extends north-eastward to nearly abreast Brouwershaven gat. Like the Schouwen, this shoal is also 15 miles long in an E.N.E. and W.S.W. direction, and it is one mile broad, except at its west extremity, which is irregular in breadth and depth. The shallowest water is at the ends. At the west end, which is separated from the Rabs by an oblique 12-fathoms channel, there are several patches of 4 fathoms, and at the east end is one patch of 3 fathoms, but over a space nearly 8 miles long between these shoal parts there are 6 and 7 fathoms.

No marks for the shoal portions of the Middel bank can be given, they either cover or are covered in by other shallows; but it is well to remember that Middelburg spire in line with Domburg church, S.E. by S. ¼ S., leads between the Schar and Schouwen bank, across the deep water on the Middel bank, and through the swatchway of the Steen banks to a fairway for either the East gat or the Roompot.

STEEN, or STONE BANKS, 2 miles within the Middel bank, and the last of the series of off-shore shoals now under notice, are, to the westward a distinct ridge, covering in the Steen deep, or Walcheren road, but their east end is connected with the flat from the main. The Steen banks are divided into two portions, and completely cover in and cross the approach to the Roompot. From the depth of 5 fathoms upon the west end of the banks, West Kapelle tower bears S.E. by S. 8½ miles; from which point their general direction to the like depth at the east end is E. by N. ½ N. 11 miles. The Noord Steen bank, which lies directly across the approach to the Roompot, is the shallower, there being about 2½ fathoms upon it in some places, and only one fathom on its south-west end. The Zuid Steen bank has 3½ fathoms water on its shoalest part. Between them is a swatchway one mile wide, with 4½ to 8 fathoms in it; the mark through which, previously mentioned, is Middelburg spire and Domburg church in line, S.E. by S. ¼ S.

West Kapelle windmill on with, or a little open to the north-east of the sand-hills called Walcheren duins, S.E. by S., leads to the south-west of the Steen banks; Middelburg and Oost Kapelle churches in line

S. by E. ¼ E. leads to the north-eastward of the shallowest parts of the bank.

The foregoing are all the offing shoals; those which follow bound the entrance and channels of the East Schelde.

Buoy.—A black and white buoy in horizontal stripes, is moored at the south-west end of the Steen in 7 fathoms water, with West Kapelle lighthouse bearing S.E. by S. 8¼ miles: the fairway red buoy of the Duerlo channel S.S.W. ½ W. 4½ miles: the Outer black buoy of the Roompot E. by S. ¼ S. 8 miles; and the Bell beacon vessel of the Schouwen N.E. ½ E. 12½ miles.

The STEEN DEEP, or WALCHEREN ROAD, as the channel is at times called, is covered in to the north-west by the Steen banks, and to the southward and eastward by the Kneerens, Rassen, and Banjaard. It is about 2 miles wide, and 8 miles long, in an E. by N. ½ N. direction, with 12 to 7 fathoms water in it, and has regularly shelving sides. The bottom is clay, in which anchors hold well.

DIRECTIONS.—To enter the Steen deep, the passage either to the south-west or north-east of the Steen banks, or the swatchways between them, may be taken, using the several marks just given.

In proceeding through the swatchway, with Middelburg spire and Domburg church in line, S.E. by S. ¼ S., in order to ascertain the situation of the vessel, observe, that while the angle between West Kapelle and Domburg steeples is less than 18° 12′, she will be to the north-westward, or outside the swatchway; when the angle between the same objects is 20° 15′ she will be in it, in from 4½ to 6 fathoms: and when the angle is farther increased to 22° 27′, she will be within the banks, and must steer E. by N. ½ N. to the anchorage. The best anchorage is with Middelburg spire in line with the west end of the wood between Oost Kapelle and Domburg, S. by E. ½ E., and West Kapelle church S. by W. ¼ W.; the depth 7 and 8 fathoms. Here, should the wind come to blow hard on shore, some shelter might be afforded by the Noord Steen bank, or, if obliged to put to sea, an outlet would be found at either end of the banks, or through the swatchway; the Roompot would also be open.

The ROOMPOT, the principal entrance into the East Schelde, is formed between the Kneerens shoals and the shore of Walcheren to the south-westward, and the South Banjaard to the north-eastward. At first the direction of the channel is S.E. and its breadth is contracted to less than a mile by the Banjard Rassen; here its depth is from 5 to 6 fathoms. Within the Rassen, from No. 2 buoy, the direction of the channel changes from S.E. to E. ½ S., and the depth increases to 12 and 16 fathoms; a little southward and eastward of No. 2 black buoy there are 4 fathoms.

KUEERENS, or Domburg Rassen, extends from the shore of Walcheren directly abreast Domburg, forming the eastern boundary of the Oost gat (page 109), and the western boundary of the Roompot. From the depth of 17 feet upon the outer part of this shoal, Domburg church bears S.S.E. 3½ miles, from which point, its western side trends towards West Kapelle tower, and the eastern side about S.E. The Kueerens is broken in form, and irregular in depth, 14 and 18 feet being the prevailing depth; there is generally a short breaking sea upon it, which renders it dangerous for a small vessel to approach. From near the inner part of it a 12-feet ridge extends in an easterly direction, and joins the shore abreast Oost Kapelle. The appearance of the shallow water upon this ridge will generally serve to distinguish it from the deeper water within.

Buoys.—A red beacon buoy lies in 4½ fathoms on the north-west side of the centre part of the Kueerens, with Middelburg spire a little north of Aagtekerke, S.E. by S.; and West Kapelle light-tower S. ¼ W.

A white buoy is placed in 4½ fathoms to the N.E. of the outer part of the Kueerens, with Domburg church bearing S. ¾ E.; the two mills at West Kapelle in line; and West Kapelle light-tower S. by W. ¾ W.

SOUTH BANJAARD BANK. — The North and South Banjaard are extensive flats, which bound the entrances of the East Schelde.

The south-west side of the South Banjaard forms the north-east side of the entrance into the Roompot. This bank is in the form of an irregular triangle, and divided by swatchways; from the depth of 15 feet upon its north-west extremity Domburg church bears S. by W. ½ W. 5 miles, from whence its south-west side of like depths has an irregular direction, S.E. by S., for 3 miles to its south-west angle, and within 1⅓ miles of the shore at Oost Kapelle; the south-east side of the bank then extends eastward with a northern curve for 4 miles. A considerable space on this bank named the Noordland dries.

The southern portion of this bank is called the Hompels, upon which there are places with only 3 to 6 feet at low water, a deep channel intervening; and off the west side is a flat of irregular depths with a patch of 17 feet called the Rassen, forming the northern boundary of the Roompot.

NORTH BANJAARD BANK, extending 7½ miles in a westerly direction from Schouwen island, is separated from the South Banjaard by the Middle or West gat, and its north edge is the south side of the entrance into Brouwershaven. This extensive sand is steep-to on the outer side, and is shallow throughout; a considerable portion at its south-east end, named Zeehonden plaat, dries at low water. There are several swatchways through the North Banjaard, but they are of little use, except to the small coasters and fishermen.

The West gat, between the Banjaard banks, though deep, is narrow, constantly varying, and unbuoyed, and it is therefore but little used. Its entrance is obstructed by a bar of hard ground, with but 11 feet over it at low water. West Schouwen church bearing E. ¾ S. leads up through the deepest water south of the bar to within 2 miles of the shore.

Buoys.—The following buoys mark the sea face of the Banjaard banks:

The North buoy of the Banjaard lies in the channel nearly three-quarters of a mile south-east of the east end of the North Steen banks, it is white with a perch; with Schouwen lighthouse E.S.E. 7 miles.

Banjaard West buoy, a large white nun with red ball, lies off the north-west end of the South Banjaard in 9 fathoms water, and two thirds of a mile W. by N. from the western extreme of the bank of 11 feet, called De Bol; with Schouwen highest lighthouse E. by S., 8½ miles, West Kapelle light tower S.S.W. (page 94), 9¾ miles; and the North buoy N.E. by E. ½ E. 2 miles.

The following black buoys upon the south-west side of the South Banjaard and the south side of the Hompels, mark the entrance to, and the north side of the Roompot channel.

The Outer buoy of the Roompot, a black nun with a basket cone, lies in 5½ fathoms water at the south-west end of the Banjaard Rassen, and three-quarters of a mile from the 17 feet patch upon it. The buoy lies with Domburg church bearing S. by W. westerly 3½ miles, the Oosterhoofd lighthouse S.E. ¼ S. 3 miles, and the white buoy on the opposite side of the channel, marking the north-east side of the Kueerens, W. ¼ N., 1¼ miles nearly.

From the Outer black buoy the other buoys lie in succession, as follows:—Outer buoy to No. 2 buoy, at the south-west angle of South Banjaard flat, S.E. by E., 2 miles; No. 2 buoy to 3, at the south point of the Hompels, E. by S. ¾ S., 1¾ miles; No. 3 buoy to 4, East 1½ miles; No. 4 buoy to 5, at the south-east side of the Hompels, E. by S. ½ S., three-quarters of a mile; No. 5 to 6, at the south-east end of the spit, E. by S. ½ S., one mile. North of this spit there is a channel of from 4 to 6 fathoms, entered at No. 3 buoy, with an outlet between No. 6 and No. 1 buoy of the Neeltje Jans.

VEERE GAT SANDS.—Veere gat, or channel, leading from the Roompot towards Veere, between the Bree zand and the shore of Walcheren to the westward, and the Onrust, Schotsman, and Ruiter plaat, flats lying out from North Beveland, to the eastward.

The Bree sand is a portion of the strand of Walcheren on the west side of the entrance to the gat, its north-east spit is marked by two white buoys, lying continuously in a S.E. by S. ½ S. direction within the distance of two-thirds of a mile of each other. At the innermost buoy, the channel bends sharply to the southward, and then follows the shore of Walcheren to the south-eastward.

The Onrust is a flat extending from the north-west point of North Beveland, and bounding the east side of the entrance to Veere gat, and the south side of the Roompot. Its north-west spit, at the entrance of the gat, is marked by a red buoy lying nearly half a mile from the shore of Walcheren, with the great tower at Veere just appearing shut in upon the duins at the north-east end of the island, S. by E. ¼ E. The north side of the Onrust is very steep, except at its north-east angle, named the Schaar of Onrust, which is marked by a white buoy with a basket cone lying in 5 fathoms water a long mile from the north-west part of North Beveland, and W. by S. one mile from No. 6 black buoy at the south-east spit of the Hompels, and S.E. by E. one mile from No. 4 buoy, and half a mile from No. 5 black buoy, which gives the breadth of the channel. A second white buoy No. 3, in 6½ fathoms water, also marks the Schaar. The south-west side of the Onrust is marked by two black buoys lying near each other, S.E. ½ S. three-quarters of a mile from the red buoy, and directly opposite, and only 3 cables from the white buoys on the Bree zand.

The Schotsman and Ruiter plaat are the higher portions of the flat projecting from North Beveland; their western side, bending regularly from the south-westward to the south-eastward, and following the shore of Walcheren, is marked by four black buoys, three of which are upon the Schotsman, and one upon Ruiter plaat, the last buoy being rather more than a mile North from Veere.

THE NEELTJE JANS and ROGGEN PLAAT occupy nearly the whole bed of the East Schelde between North Beveland and Schouwen, and though separated by narrow swatchways which can be used by small vessels, they may, from the continuity of their outlines, be regarded as one sand. The south-west end of the Neeltje Jans bank is connected with the Noord-land, the dry portion of the South Banjaard, by a spit having from one to 12 feet of water over it, from whence it extends easterly for 6 miles, and is 2 miles broad. The south side of this bank forms the north boundary of the main channel of the East Schelde, and its north side is a portion of the south boundary of the Hammen channel. On every side it is steep-to, and the greater portion of it dries.

The Roggen plaat extends easterly from the Pijp swatchway, its south-east spit being 1½ miles to the north-west of Zierikzee harbour, and its eastern edge, following the curved shore of Schouwen, forms the remaining portion of the west boundary of the Hammen channel. Nearly the whole of it dries at low water.

A small sand, named Nunne plaat, which is barely covered, lies opposite Noord Kissers nolle, between the east side of the Roggen plaat and the shore of Schouwen.

The Hammen channel is in continuation of the West gat between the Banjaard banks; the sands bounding it occasionally drift, and it is unbuoyed.

Buoys.—The following black buoys upon the south side of the Neeltje Jans bank and the Roggen plaat mark the north side of the main channel of the East Schelde towards Zierikzee:—No. 1 buoy, at the south-west spit of the Neltje Jans bank, bears S.E. ¼ E., 1¼ miles from No. 6 black buoy at the south-east spit of the Hompels, and E.S.E. upwards of 2 miles from the white perch buoy near the Schaar of Onrust; No. 1 to No. 2 buoy on the south side of the Neeltje Jans E. by S. 1¼ miles; No. 2 to No. 3 buoy at the south-east spit of the Neeltje Jans E. ¼ N. 1¾ miles; No. 3 to 4 buoy lies N.E. by E. one mile; and No. 4 to 5 is E. ¾ N., nearly three-quarters of a mile; No. 5 to 6 buoy at the south-east point of Roggen plaat is E. by S. ¾ S., 1½ miles, and nearly 1½ miles N.W. of the lighthouse at the entrance of Zierikzee harbour.

The VUILBAARD, south-east of the above-mentioned banks and abreast the village of Colijnsplaat in North Beveland, is a long straggling bank, divided in two opposite Zierikzee by a channel a quarter of a mile wide, lying in the centre of the channel between Zierikzee and the south shore, and forming the south and west sides of a portion of the principal channel. A great part of the northern, and a patch on the southern portion of the Vuilbaard dries, and the remainder is very steep; the end of its west spit lies S.E. one mile from the south-east spit of the Neeltje Jans, and a mile from the shore of North Beveland; from thence, the north edge of the sand extends N.E. by E., 1¼ miles, to within half a mile of the bight of Roggen plaat; then S.E. southerly 3 miles, past the entrance of Zierikzee harbour.

To the eastward of Colijnsplaat a spit having only 3 feet water on it, projects from the north-east point of North Beveland for half a mile towards the southern side of the Vuilbaard, narrowing the channel on the western end to one third of a mile wide, with 24 feet water in it.

Buoys.—The north and east sides of the Vuilbaard are marked by six white buoys; No. 1 buoy at the west spit bears S.E. by E. ½ E. two-thirds of a mile from No. 3 black buoy, at the south-east spit of the Neeltje Jans bank; No. 1 to No. 2 buoy at the north-west elbow of the shoal, N.E. by E. three-quarters of a mile; No. 2 to No. 3 buoy with a staff and ball, marking the northern limit of the sand, is E. by N. ½ N. three-quarters of a mile; No. 3 to No. 4 buoy is E. by S. ½ S. half a mile; No. 4 to No. 5 buoy on the north-east edge of the bank and opposite Zierikzee lighthouse, is S.E., three-quarters of a mile; No. 5 to No. 6 buoy on the southern end of the southern portion of the bank, is S.S.E. 2¼ miles.

ZIERIKZEE ROAD, between the shore of Schouwen to the north-eastward, and the spits of the Vuilbaard, Galge plaat, Vondelingen plaat, and Dortsman to the southward, has its latter boundary indicated by red buoys lying upon the spits of the three last-mentioned sands. Near the shore the depths vary between 9 and 20 fathoms; the anchorage is, therefore, over towards the south side in 10 fathoms.

From near Zierikzee harbour the main channel of the East Schelde trends to the southward, and is bounded on the west by the Vuilbaard bank, and by North Beveland. It then follows the shore of South Beveland, in a south-easterly direction. On the east and north-east sides lie various banks which contract its breadth in some parts to half a mile, but the water is deep, varying from 7 to 16 fathoms.

GALGE PLAAT, the first of these banks, lies nearly midway between North Beveland and Tholen islands. Besides the red beacon buoy at its north spit, which lies N.E. rather more than half a mile from the south-east buoy of the Vuilbaard, the west side of Galge plaat is marked by two black buoys.

VONDELINGEN PLAAT, lying a little farther eastward, is connected with Galge plaat; indeed, they may be considered as the tongues of one sand. The south-west side of Vondelingen plaat is marked by a black buoy, and its south-east extremity by a red buoy lying N.N.W., 1½ miles from Wemeldinge lighthouse in South Beveland, and three-quarters of a mile from the strand of that island. The east side of Vondelingen plaat, forming the west side of Brabandsche channel, is marked by four white buoys, and by several beacons towards its southern end.

DORTSMAN is a flat on the west side of Tholen island. It terminates to the north-west in a spit half a mile S.W. by W. from the Hoek van Ouwerkerk in Duiveland. The red buoy upon the spit lies S.E. by E., 1¾ miles from the red buoy on the north spit of Vondelingen plaat; its northern edge is marked by a white buoy lying S.E. by E. two-thirds of a mile from the red spit buoy. The spit of the Dortsman forms the west and south-west boundaries of Keeten road, which affords safe shelter. The Dortsman dries, and is steep-to on all sides. Its western edge, forming the eastern side of Brabandsche channel, is marked by one red and three black buoys, and by numerous beacons.

MIDDEL PLAAT is between the Dortsman and the south-eastern end of Vondelingen plaat. A red buoy is placed on its north-west end: two white buoys upon its eastern side, where it nearly closes up the channel: and another white buoy at its south-east extremity, bearing S.E. by E. ½ E. 2⅓ miles from the red buoy at the south-east end of Vondelingen plaat, and N.W. by W. 1⅓ miles from Gorishoek lighthouse Its western side is marked by three black buoys. The Middel plaat dries over a considerable portion, and is connected with the south part of the Dortsman by shallows of from 6 to 12 feet, with deeper water between.

The Brabandsche Channel, lying between the Vondelingen plaat, on one side, and the Dortsman and Middel plaat on the other, is used only by small vessels which pass this way from Keeten road upwards.

The channel of the East Schelde has now been traced as far as is necessary for the general use of seamen.

TIDES in the EAST SCHELDE.—Off the gats of the East Schelde the streams of tide have the same rotary motion as those off the gats or channels of the West Schelde, as noticed in page 102.

In the Roompot the flood runs at the commencement towards the shore, the same as in the Weilingen, but inside Oost Kapelle its direction follows the coast.

In the Roompot the flood and ebb run in and out about two hours longer than in Veere gat, on the other side of the Onrust, making the latter part of the ebb of the Roompot the first of the flood in the Veere gat.

In the Veere gat the tides run fairly in and out, being hemmed in by flats, and the ebb, uniting at the Onrust with that of the East Schelde, runs along by Oost Kapelle and Domburg, where it is again joined by the stream through the Oost gat, and the united streams proceed about north-north-west to the sea. In the same manner the flood tide stream divides at this spot, running partly into the Roompot and partly into the Oost gat. This divergence and collision of the flood and ebb produce those eddies which have formed the irregular ground of the Kueerens.

Within the point of the Noordland, at the inner extremity of the South Banjaard, the first flood takes its direction over the Neeltje Jans; and in like manner the first ebb draws northerly over the banks, on which account, both in going in and coming out, it is necessary to be guarded against this influence in light winds and calms.

It is high water, full and change, at Veere gat at 1h. 0m.; springs rise 15 feet, and neaps 11 feet; and at Zierikzee at 2 p.m.; springs rise 10½ feet and neaps 9 feet, but the strength and direction of the wind will make a great difference in this respect.

Although there are many causes that affect the rise and fall of the tides, yet the observations made during 1859, with great accuracy, every half hour, have given the following results of the mean rise and fall every hour at Zierikzee.

	Mean rise.			Mean fall.	
	ft.	in.		ft.	in.
On the 1st hour of flood	0	8	On the 1st hour of ebb	0	8
„ 2nd „	1	3	„ 2nd „	1	6
„ 3rd „	1	6	„ 3rd „	2	4
„ 4th „	2	0	„ 4th „	2	4
„ 5th „	2	4	„ 5th „	1	6
„ 6th „	1	3	„ 6th „	0	8

DIRECTIONS for the EAST SCHELDE through the ROOMPOT.—The approach to the Roompot is from the Steen deep, the directions for which have been given in page 120.

Veere church open westward of Oosterhoofd lighthouse, S.E. ½ S., leads up the entrance between the Banjaard and Kueerens banks, on the former of which the ground is hard compact sand, that of the channel being soft.

The leading mark also into the Roompot, from the anchorage in Steen deep, to that above mentioned, is Middelburg spire in line with the wood showing over the dunes between Domburg and Oost Kapelle, S. by E. ½ E. easterly. This wood is not readily distinguished, as it is but little above the levels on either side of it, but Middelburg spire kept about one-third the distance from Oost Kapelle church to Domburg church will lead to it between the outer black and white buoys. The first mark named kept on until West Kapelle windmill appears to the eastward of Hakkelingen sand-hill S.W. ¼ S., will lead to a position about one mile within the outer buoy of the gat, when an E.S.E. course made good for 3½ miles, will lead to the entrance of Veere gat.

Working in, the ridge on the south side in connexion with the Kueerens as far as the Oosterhoofd, will be avoided by keeping a barn near the north-west point of North Beveland open of the main shore of Walcheren, bearing about E.S.E. For the north side, as there are no long marks, the black buoys and the lead will be the best guides.

Through the VEERE GAT.—Both the depth and the shape of the channel through the Veere gat are continually varying, but the arrangement of the buoyage is always the same, as to colour, viz.: black buoys to the eastward and white buoys to the westward. The depth on the Drempel or bar between the inner two buoys is about 9 feet at low water.

The passage through Veere gat is very narrow, but when a vessel has advanced as far up as the Schotsman and Ruiter plaat she will have the advantage of shelter all round, and will be little incommoded by a rough sea. From the bar, the channel trends S. by W. to No. 4 black buoy at the junction of the Schotsman and Ruiter plaat, where it trends S.E. ½ S.

towards Veere. It has already been noticed that the tide streams take the direction of the banks, and run fairly in and out.

Up the EAST SCHELDE.—The channel of the East Schelde, by Zierikzee, in continuation of the Roompot, is marked by the black buoys of the Hompels, Neeltje Jans, Roggen plaat, Galge plaat, and Vondelingen plaat, on the port hand, and by the white buoys of the Schaar of Onrust and the Vuilbaard, on the starboard hand. The average breadth of the channel is upwards of half a mile, and the depths vary between 6 and 16 fathoms. Its tortuous character has already been noticed in describing the sands bounding the channel.

From nearly mid-channel between the red buoy and white beacon buoy of the Onrust and the black buoys of the Hompels, the course is East for a short distance, and then S.E. by E. ½ E. to the black buoy on the south-west point of the Neeltje Jans bank. From this buoy the course is E. by S. ¼ S. for 1¾ miles and then E. by N. 2⅓ miles to the second white buoy on the North-west elbow of the Vuilbaard, and whence on between No. 5 black buoy on the south side of Roggen plaat and the white beacon buoy at the north spit, where the channel turns sharply, and then south-eastward 3 miles, leaving the white buoys on the starboard hand past the head of Zierikzee harbour to Zierikzee road, where the anchorage is over towards the red buoys upon the sand spits to the southward, in 10 fathoms, good holding ground.

In working into the East Schelde, as soon as Middelburg spire appears shut in upon North Beveland S.W. ½ S., the vessel will be clear of the Hompels and may stand by the lead towards the south-west side of the Neeltje Jans bank, as the soundings thereabout are regular, but afterwards, the sides of the channel are too steep to be approached in that way, unless the vessel be lively and smartly worked.

Vessels may anchor one-third or half a mile off the shore of North Beveland from Oudelek as far as Colijnsplaat, or to within the Vuilbaard in from 10 to 14 fathoms water.

From near Zierikzee, the main channel of the East Schelde continues in a S. ¾ W. direction between the Vuilbaard and Galge plaat, and between the latter and the shore of North Beveland as far as the second black buoy of Galge plaat to the north of Zandreek which separates North from South Beveland, and afterwards S.S.E. and S.E. by E. between the Vondelingen and Middel plaats and South Beveland. Of this portion of the channel it will be only necessary to say that as far as Gorishoek it is broad and safe, with regular soundings and deep water, there being seldom less than 6 fathoms, so that the largest ships may run in from sea and up the river to that point of Tholen island, but from thence to Bergen-op-

Zoom the channel is narrow and intricate, and no stranger should take it without a pilot.

Zand kreek, a narrow but well buoyed and beaconed channel with not less than 10 feet water in it; its western entrance, the Zuid vliet, runs from the middle of Veere gat opposite Middelburg haven, and joins the East Schelde about a mile north of the entrance of Goes haven in South Beveland.

Through the WEST GAT and HAMMEN CHANNEL.—Although the West gat between the Banjaard banks is constantly changing and unbuoyed, it is at times a convenient passage to vessels approaching from sea, north of the Steen banks, and bound to Zierikzee. (*See* page 122.) Attention to the lead and a good look out being very necessary.

After passing the two white buoys north-west of the Banjaard from the northward, a S.S.W. course may be steered for West Kapelle lighthouse for 2¼ miles until West Schouwen church bears E. by S., at which point Middelburg steeple will be on a line with Oost Kapelle, bearing S. by E. ¼ E., keep these objects in line for a short distance until West Schouwen church bears E. ¾ S. The West gat may then be entered on the last-named course, through the south deep of the bar, in from 3½ to 4 fathoms water, and steered for about 5 miles until between the Noordland and Zeehonden plaat, where there will be 11 fathoms, soft ground ; Schouwen point should then be brought on the port bow, and when Middelburg spire appears to the eastward of Haak duins, these banks will have been cleared, and the channel then becomes broader and shallower. From this point small vessels may sail from the West gat into the Roompot by keeping Middelburg spire to the eastward of fort Haak (in ruin) ; this mark leads over the narrow neck which unites the Noordland to the Neeltje Jans bank, in 6 or 8 feet at low water. From the south buoy of the North Banjaard, or that with a red ball, the West gat may be entered on a S.E. ¾ S. course for 3 miles, the depth is about 3½ to 4 fathoms at low water, similar to that on the south side of the bar.

In proceeding towards the Hammen channel (page 124), the south-west point of Schouwen must be kept to the eastward of E. by S. to avoid the spit of Krabben plaat, which lies parallel to the west side of the island. The channel borders the island closely as far as Burgsluis haven ; farther eastward, the projecting flats of Koudekerke and Roggen plaat contract the width of the channel considerably, and it is necessary to steer from abreast the haven directly towards the water-mill of Schouwen (the westernmost building within that part of the dyke) ; bearing about East it will lead in not less than 29 feet up to within two ship's lengths of the dyke. From thence the channel runs close along by the shore to the dyke heads of Zierikzee harbour, near which stand the lighthouses noticed in page 117. Between the Roggen plaat and Schouwen the channel is deep, but it is very narrow in passing Nunne plaat.

Life boat.—There is a life boat station at Burgsluis.

RIVER MAAS or MEUSE flows through part of Belgium and Holland, and is joined by branches of the Rhine, one at Gorcum, and the other near Amsterdam. It empties into the North Sea by three mouths, between Schouwen, Goeree, Voorne, and the Hoek of Holland. These all communicate with one another by minor channels or canals, and have upon their banks the towns of Brouwershaven, Hellevoetsluis, Willemstadt, Rotterdam, &c.

BROUWERSHAVEN GAT.—The town of Brouwershaven, at the eastern part of the north side of Schouwen, gives its name to the gatway or main navigable channel between the islands Schouwen and Goeree, the southernmost of three passages into the river Maas.

The town is ancient, is much decayed, and its fortifications have been removed. The population, numbering about 1,100 persons, are nearly all agricultural; the herring fishing, which was formerly prosecuted from here, being now all but extinct. A British vice-consul is resident. The harbour is dry at low water, and only fit for small vessels.

The road of Brouwershaven is frequented by vessels bound to Dordrecht and Hellevoetsluis; here they discharge a portion of their cargoes, and are then towed to their place of destination. The road has the advantage of excellent holding ground, and being well protected by the shoals, is seldom troubled with sea.

The general appearance of the seaward part of Schouwen island, its white sand-hills, the Woolpacks, at the west end, and the prominent character of Zierikzee church, have been already noticed in page 116.

Goeree island on the opposite side, and 11 miles from the entrance to the gat, when viewed from a distance appears as detached white hummocks, those at the western end being the highest. It is necessary to remark, that the absence of a light-tower at its outer or western end should prevent its being taken for Schouwen, page 140.

Brouwershaven gat has on its south side, the North Banjaard and the shore of Schouwen, and on the north side the Ooster zand. Its entrance is about three quarters of a mile wide, from a low-water depth of 4 fathoms on each side, to abreast the west end of Schouwen; farther eastward, its width is contracted by the projecting points of the banks; and opposite the Schaar of Renesse the channel is only a quarter of a mile wide, with 4½ fathoms in it, increasing to 7 or 8 fathoms till near Brouwershaven, where, especially close under the shore, there are from 10 to 11 fathoms, and in the road from 7 to 9 fathoms.

To the eastward of the Middel plaat, Brouwershaven channel is divided into three navigable branches.

PILOTS.—The Brouwershaven pilots cruise off Dungeness in cutter-rigged vessels; and off the gat, within range of Schouwen light, in round-sterned vessels, with two masts. They have the words *Goeree*, *Maas*, and *Brouwershaven*, painted in large letters on the main-sail. While in company with other pilot-vessels, they show a blue flag with their number, and also the Dutch flag from the gaff end. In the event of a pilot-vessel not being fallen in with, the life-boats belonging to the Zuid Hollandsche Redding Maatchappy are generally on the look-out to supply qualified persons, or to render assistance. The life-boats have discontinued carrying a flag or a name in their main-sail, to avoid being mistaken for pilot vessels.

LIFE-BOATS.—There is a life-boat stationed at Brouwershaven.

These vessels are built and rigged on the model of the well-known fisher boats called Schokkers, from the little island Schokland, where most of them are fitted out; and perhaps no class of vessels ever possessed, in a like degree of perfection, all the qualities for weathering the severest gale, either in deep water or among the shallows of the banks.

The object of the South Holland Society, founded in Rotterdam in 1826 for rescuing Seamen in distress of Shipwreck, to which the above vessels belong, is purely philanthropic, being, as its name implies, the saving the lives of seamen in danger of the high seas on the Dutch coast. In order to effect this, it has established sailing vessels on some parts, and row boats on other parts of the coasts of Zeeland and South Holland, which are regularly manned, and well furnished with floating apparatus, lines, &c. and which are kept always in a state of readiness to start off at a moment's warning.

There are six principal stations for the life-boats, viz.: West Kapelle, in the island Walcheren; Burgsluis and Brouwershaven, in the island Schouwen; Rokanje, in the island Voorne; and Monster, and Zer Heide, on the main shore of South Holland. Those at Burgsluis and Brouwershaven are sailing vessels. The row boats of the society are built on the model of the whaler boats, but they are considerably wider. They are painted green with a white keel, and have, fore and aft, the name of the society in large black letters. As yet, most of them are of wood, but it is intended to have them all made of iron. They are six-oared, and can each carry from 15 to 20 men in all.

When a shipwreck occurs in the intermediate space between the stations, the boats are transported to the place of wreck by means of waggons drawn by horses appointed for that purpose. The buoyancy of the boat, in case of its becoming filled, is made to depend partly upon air-tight boxes under the seats, and partly upon a quantity of rush (scirpus), with which the boat is stuffed around at the gunwale; and when a sea is shipped, valves open in the bottom through which the water escapes, whilst the boat is forced upwards by the pressure of the air within. Each boat has a crew of six men and a coxswain. In summer they are regularly trained in the management of the boats, and during that season they receive wages, but in winter they receive premiums in proportion to the number of persons saved.

LIGHTS.—The chief objects which serve to distinguish Schouwen from the islands near it, are the several lighthouses standing on the north-west and on the north parts of the island, for the purpose of distinguishing the coast, and for leading marks in and out through Brouwershaven gat.

Schouwen lighthouse, the principal of these, is a circular stone tower, standing on one of the sand-hills at the north-west extremity of the island near the Hoek of Schouwen. It exhibits at 171 feet above high water a white light, which *revolves* every *minute and a half*, showing at each revolution for a period of *twenty-five* seconds, and its greatest brilliancy continues *ten* seconds. The light is seen from a distance of 22 miles in clear weather.

Verklikker light for showing the anchorage and assisting in the navigation of Brouwershaven gat, is exhibited from a wooden lighthouse upon the shore of the north-west face of the island, N.E. ¼ E., one mile from Schouwen lighthouse; it is a *fixed* white light, elevated 55 feet above high water, and visible at 6 miles.

Haamstede light at half a mile E. ½ N. of Verklikker lighthouse is a *fixed* white light, exhibited as a leading mark for the danger of the Schaar van Renesse.

Renesse.—The two light-towers at Renesse, at the north side of the island, half a mile from the village of that name, are of stone and iron, and bear E. by S. ¾ S. and W. by N. ¾ N. from each other, distant 850 yards apart. Both lights are *fixed* and white, the eastern 148 feet and the western 113 feet above high water, and are visible 16 miles; and to prevent their being mistaken for other lights, they are screened so that the western light can be seen only between the directions of E. ½ N. and S.E. ½ S., and the eastern light between the bearings of E. ½ N. and S.E. ½ E., or for 3 or 4 miles on either side of the approach to Brouwershaven gat, for which when in line they are the leading lights. The eastern light also shows a red sector between S.E. ½ E. and S.E. ½ S.; and a white light between S.W. by W. and N.W. by W.

Ossenhoek.—The *fixed* white light shown from Ossenhoek on the end of Lange dike, near Brouwershaven, and first visible upon a S.S.E. bearing, is intended to assist the pilots in navigating the inner part of the channel; it is elevated 22 feet, on a wooden structure.

Zijpe is a *fixed* white light on, and near the dike half a mile south of Bruinesse, with a strip of *red* light to lead clear of the white buoys on the western end of the Noordplaten.

SOUTH SIDE of GAT.—The north side of the North Banjaard, page 121, is the south side of Brouwershaven gat. One portion of the sand, named Nieuwe (new) sand, dries near to the north end of Krabben gat, an in-shore swatchway between the Banjaard and the shore of Schouwen, connecting the Hammen channel and Brouwershaven gat, but too narrow and shallow to be used except by small coasters. The Banjaard on the side of Brouwershaven gat is steep-to.

Buoys.—Besides the buoys westward of the Banjaard, page 122, the south side of the gat is marked by the following white buoys, placed near the edge of the banks:—The Outer, or No. 1 white buoy, lies with Schouwen lighthouse bearing S.E. ¼ E. 4½ miles; and the outer black buoy of the gat, at the south-west end of Ooster sand, N. by E. three-quarters of a mile. No. 1 to No. 2 buoy, E. by S. ¼ S., one mile; No. 2 to No. 3 buoy, E. by S. ½ S., 1¼ miles; No. 3 to No. 4 buoy, E. by S. ¾ S., one mile; No. 4 to No. 5 buoy, which lies nearly abreast Verklikker lighthouse, E. by S. ¾ S., 1¾ miles; and No. 5 to 6 conical beacon buoy, lying in the channel, outside the Schaar, a spit from the shore just to the westward of Renesse lighthouses, East 1¾ miles; a white buoy is also moored in 2¾ fathoms water inshore of the beacon buoy, and bearing from it South, nearly half a mile distant. There is a 15 feet knoll about half-way between the two buoys. The foregoing comprise all the buoys on the south side of the channel as far up as Brouwershaven. A wreck buoy lies in the gat on the line of bearing of Renesse lights, with Schouwen lighthouse bearing S. by W. ¾ W. A beacon with a triangle is placed at Ossenhoek, at the entrance of the port of Brouwershaven.

It may be here remarked that about 1¼ miles W. by N. from the outer black buoy of Brouwershaven gat, is a small 4½-fathoms patch, with 6 and 7 fathoms about it. The ridge of similar character, in continuation of the Steen banks, lies out 1½ miles from the outer edge of the North Banjaard.

OOSTER ZAND (Easter sand), of a triangular form, extends for the distance of 10 miles from Goeree, and forms the north boundary of Brouwershaven gat, and the south boundary of Goeree gat. Ooster zand includes the Middel plaat, Kabbelaars plaat, and all the sands on the north side of Brouwershaven gat, as they are parted from it only by small blind channels, which the ebb from Springer deep and from Brouwershaven gat would appear to have formed.

A great portion of this extensive sand has less than 6 feet depth over it. The highest parts are Rug-van-den-Ooster, a narrow ridge near the outer part of Brouwershaven gat, Steile hoek, and Kabbelaars plaat, near the body of the sand; Middel plaat, near the side of the gat, abreast Renesse lighthouses; and the Springer, a projection from the west part of Goeree island, partly dry at low water, and bounding the north-west side of Springer deep.

The northern part of Ooster zand, sweeping round to the West gat of Goeree, has near its edge some patches which dry; along this side of the sand the ground is soft, and the depths in many parts are irregular, so that it cannot be approached at night by the lead with safety.

Buoys.—Ooster zand is well buoyed. Upon its outer or north face is a large nun buoy, striped black and white vertically, with staff and triangle; it lies in 8 fathoms, at 1½ miles from the depth of 4 feet upon the Steile-hoek, with Schouwen lighthouse bearing S. ¾ W. 5¾ miles, and Renesse lighthouses S.E. by S. ¼ S. 5¾ miles.

The following black buoys are upon the south side of Ooster zand, and mark the north boundary of Brouwershaven gat; they are generally at the distance of half a mile from the Banjaard buoys, or the shore of Schouwen on the opposite side of the channel. The outer buoy of the gat, at the well-defined west extremity of Ooster zand, marks the north side of the entrance; it is a large black nun with staff and Dutch flag, and lies in 7 fathoms, with Schouwen lighthouse appearing just to the southward of the small square beacon (Scherm) on the sand-hills in front of it S.E. ⅓ S., and Renesse lighthouses nearly in line E.S.E.; the western perch buoy of the Banjaard W. by S. ¾ S. 3½ miles; and the bell beacon N.W. ½ W. 5 miles. From No. 1 buoy to No. 2, E. by S. ½ S. 1¼ miles; No. 2 to No. 3 buoy, E. by S. ¾ S. nearly one mile; No. 3 to No. 4 buoy, E.S.E. one mile; No. 4 to No. 5 buoy, E. by S. ½ S., 1¾ miles; No. 5 to No. 6 buoy, on the south side of the Rug-van-den-Ooster, E. by S. ¼ S., 1½ miles; No. 6 to No. 7, buoy, E.S.E. one mile (Nos. 6 and 7 are nearly opposite the white buoy of the Schaar, and are at the narrowest part of the channel); No. 7 to No. 8 nun buoy, at the south part of the Middel plaat, S.E. by E. nearly one mile; No. 8 to No. 9 buoy, opposite the entrance of the swatchways, E.S.E. 1¼ miles; No. 8A. buoy between Nos. 8 and 9 buoys to cover a shoal point which has recently extended out into the channel from the Middel plaat. No. 9 to No. 10 buoy, at the south-west point of the Hompelvoet, E. by S. one mile; and from No. 10 to No. 11 nun buoy, upon the south-west part of the Paarden plaat, and marking the north boundary of Brouwershaven road, E. by S. ¼ S. 1¼ miles. No. 11 buoy is

12 miles within the outer buoy of the gat; and half a mile N.E. by E. from the beacon at Ossenhoek.

HOMPELVOET and PAARDEN PLAAT are shallow banks, the greater parts of which are bare at low water; they separate Brouwershaven road from Springer deep. A black buoy bearing E. ¾ N. three-quarters of a mile from No. 11 buoy on the south-west part, and a black nun buoy E. ¾ S. half a mile from the former mark the south side of the Paarden plaat. No. 10 buoy upon the south-west part of the Hompelvoet has been noticed. *See* page 139.

DWARS-IN-DEN-WEG (athwart the way), is a bank for the most part dry at low water, lying nearly E. by S. and W. by N. before the harbour of Brouwershaven; with a narrow channel between it and the southern shore, which is very shallow at its eastern end. The northern channel, forming Brouwershaven road, is again split into two branches; one of which, the Vlieger, runs between the Paarden plaat and Kabeljaauws plaat into Springer deep, and the other between Dwars-in-den-weg and Kabeljaauws plaat, and so continues on to the Grevelingen channel.

A red buoy lies near the north-west point of Dwars-in-den-weg, and a white buoy at the entrance of the channel leading up to Brouwershaven, and which marks the south boundary of Brouwershaven road.

KABELJAAUWS and VEERMANS PLAATS are scarcely separated; the greater portions of them are dry at low water, and they are steep all around. They extend from Vlieger swatchway to the junction of Springer deep (The Hals) with Grevelingen channel. The latter passage, formed between Veermans plaat and the east end of Schouwen, is marked by black buoys to the north-eastward, and by white buoys and beacons to the south-westward.

INNER CHANNELS.—Springer Deep.—In the deep the depths vary between 4 and 14 fathoms, except at the entrance and the southern extremity, which have bars with from 7 to 9 feet water on them. In the entrance between the Middel plaat and the west end of the Hompelvoet there are only 19 feet water, and the passage is too intricate for any but those well acquainted. There are no marks, but the course of the deep may always be observed; and, as the banks and flats which form the channel are high and steep-to, it is advisable to wait until they begin to be uncovered, so that the channel may show itself distinctly. This remark is also applicable to the other channels. In the south end of the Springer, between the Veermans plaat and the Slikken van Flakkee (plats of Flakkee), there is a depth of 23 feet, but the passage is very narrow.

Le Vlieger, the second channel, is between the Hompelvoet and Paarden on the north, the Dwars-in-den-weg and the Kabeljaauws plaat on the south, and runs into Springer deep; its sides are steep-to and the depths in it vary from 4 to 7½ fathoms; another branch, between the Kabeljaauws plaat on the north and Dwars-in-den-weg, turns to the southward between the Veermans plaat and the shore of Schouwen, and runs by the Dijkwater onward to the road of Bruinesse. This channel, at the entrance between the red buoy at the north-west end of Dwars-in-den-weg and Hompelvoet, has only 24 feet water; but from the first white buoy half a mile east of the red one, to as far as the south end of the Veermans plaat, it has from 6 to 9 fathoms. This portion of the channel is called Grevelingen, and the Yzeren beacon of Goeree on with the great Meestoof to the south-east of Ouddorp, bearing about North, is a leading mark for a considerable part of it.

The third channel, and where small vessels anchor, between the Dwars-in-den-weg and the shore of Brouwershaven, is very narrow. A rocky shoal stretches out 155 yards from the Ossenhoek, and requires attention. At the entrance of the channel, between Ossenhoek and the west end of the bank, there are 16 feet at low water; but farther on there are 5 and 6 fathoms, to athwart the Sluisje of Brouwershaven, where there are only 5 fathoms. From this part a narrow bank borders the shore, which, from the east end of Kijkuit dikj (look-out dyke), extends farther off, and forms with the east end of Dwars-in-den-weg, a bar at the east end of this channel, on which there is less than one fathom. From Ossenhoek to the port there are posts to which vessels make fast when there is ice.

TIDES in BROUWERSHAVEN GAT.—It is high water, full and change, in the offing at Noon; at the outer buoy of the gat at 1h.; and at Brouwershaven at 2h. 0m. Springs rise 9½ feet, and neaps 7½ feet; but the strength and direction of the wind will make a great difference in this respect.

Observations made at Ossenhoek with great accuracy every half hour, gave the following results of the mean rise and fall for every hour in Brouwershaven:—

	Rise.			Rise.	
	ft.	in.		ft.	in.
In 1st hour of flood	0	6	In 1st hour of ebb	0	10
„ 2nd „	0	10	„ 2nd „	1	0
„ 3rd „	1	4	„ 3rd „	1	8
„ 4th „	2	0	„ 4th „	2	0
„ 5th „	1	10	„ 5th „	1	4
„ 6th „	1	0	„ 6th „	0	8

Outside Brouwershaven gat the streams of tide have the same rotary motion as those of the gats or channels of the West Schelde, as described in pages, 102 104. Outside the outer buoy of the gat, the southern, or flood stream, which runs during 6 hours in an irregular direction between west and south, begins here 2 hours before it is low water at Brouwershaven, and at the same time the water begins to rise.*

The northern, or ebb stream, which runs 6 hours, in an irregular direction also, between east and north, begins outside the outer buoy 2 hours before it is high water at Brouwershaven, and the water then begins to fall.

At sea, the stream of the northerly tide takes first an easterly direction, and runs into the gat, at which time vessels having an adverse wind may begin to work up the gatway towards Brouwershaven; but as the latter part of the southerly tide sets directly across the Banjaard banks, vessels should be very cautious not to approach the North Banjaard before the northerly tide has begun at sea.

Inside the Hoek of Schouwen it is high water almost an hour before it is high water at Brouwershaven, and the stream, drawing inwards, runs more regularly, taking the direction of the channel, both with flood and ebb. In the old Kous swatchway the tide turned 2 hours before it was high water at Brouwershaven, and ran in a north-east and northerly direction over the northernmost ridge of Ooster zand. In Springer deep, from the point of the Springer inwards, the flood and ebb streams run directly in and out between the shore and the banks, and there is the same regularity in the streams of the other channels above the Ossenhoek.†

DIRECTIONS.—Brouwershaven gat, from its depth and general character, is one of the safest ports on the coast of Holland for vessels of large draught. By the aid of the Renesse lights it may be entered by night or by day, and vessels being able to quit with easterly winds are, consequently, not much endangered by ice.

Vessels in the offing approaching Brouwershaven gat will, if the weather be clear, sight Middelburg spire, West Kapelle light-tower, and the other objects in Walcheren, and then the lighthouse of Schouwen, which should be kept between S.E. and E.S.E. by vessels lying to in the offing, and they should not shoal the water under 10 fathoms.

Approaching the gat from the northward, Schouwen lighthouse and beacon in line, bearing S.E. ½ S., leads across the Schouwen bank in 6 or 7 fathoms, a little north of the bell buoy, to the eastward of the Middel bank in 11 and 12 fathoms, and up to the outer black buoy of the gatway.

Approaching from the westward, keep Schouwen lighthouse E.S.E., and it will lead close to the south-westward of the shallow portions of the Schouwen and Middel banks in 6 fathoms. When West Kapelle bears

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* *See* Tidal diagram, Admiralty chart No. 122.

† It is probable that the great changes which have taken place in the banks since these observations were made will have also occasioned corresponding alterations in the set of the inshore tides.

S. by W. ½ W., the latter bank will have been crossed, and the outer buoy of the gat will then bear about East, 6 miles. On nearing the gat the Banjaard buoys will probably be seen. It is advisable not to go nearer to that sand than the depth of 10 fathoms, as it is steep-to, until Renesse lighthouses appear in line.

Of the two tracks towards the gat above noticed, the northerly one is of course to be preferred with northerly winds, and the southerly one with southerly winds.

From near the outer buoy of the gat the leading mark in, by day and night, is the Renesse lighthouses or lights in line, bearing E. by S. ¾ S. The lower of the two lights may be seen at a distance of 5 miles outside the gatway. When the gatway has been entered will be known by Goeree light becoming obscured, which continues so from the outer buoy of the gat to between the fourth white and the fifth black buoy. Be careful in keeping the Renesse lights in line at the outer part of the gat, as the first two hours of the flood sets obliquely towards the Banjaard, and the first two hours of the ebb sets towards the Ooster zand. The direction, as well as the strength of the streams is, however, influenced by the wind.

Running in by night on the line of Renesse lights, when Schouwen light comes on with that of Verklikker a vessel will be near No. 5 white buoy; thence, attending to the lead, steer E. ¼ N. until Haamstede and Schouwen lights are in line, when a vessel will be approaching No. 6 Schaar buoy in 23 to 26 feet water, the course will then be about E. by S. until the east light of Renesse shows *red* and the above buoy (if seen) is on with the light; the course then will be about S.E. by E. while crossing the red sector of light, and when the light becomes white again she will be in the middle of the channel, then steer an E.S.E. course towards Ossenhoek light which will serve as a guide for Brouwershaven road.

At night, the Verklikker light first appears on a S. by E. bearing, and serves as a caution to prepare to anchor. The anchor should be let go when the Schouwen light appears over the Verklikker light S.W. ¼ W., and Renesse lights have been brought a little open to the northward; the latter lights in line would lead too close to the south shore. In the position thus indicated, there is a depth of 4½ fathoms, and though it is not a safe anchorage at all times, it has the advantage of having a flat and partly sheltered strand closely adjoining, in case of accident.

Proceeding from this anchorage towards Brouwershaven, the course is first about E. ¾ S., 1½ miles, to beyond the white beacon buoy upon the Schaar of Renesse; from thence to abreast the Kloosternolle it is S.E. by E. ½ E., 2¾ miles, and then E. by S., for 2 miles, to Brouwershaven road. Having passed the beacon at the end of the jetty at Ossenhoek, and having Brouwershaven church bearing S. by W., and

Zierikzee church open a little to the westward of it, anchor in 7 fathoms This is the best position in the roadstead. The frequent changes in the positions of the banks render the aid of a pilot advisable.

Small vessels using the channel through the Schaar should bring Boluit mill at Brouwershaven as far eastward as the centre of the Zandhoek of Scharendike, which will take them in from 18 to 20 feet water; the narrowest part of the channel is about 1¼ cables wide.

Turning Through.—To work into Brouwershaven gat with safety, a general acquaintance with the objects, as well as with the sets of the tide streams, is necessary. As there is a leewardly set in strong north-easterly winds, the gat should not then be attempted. There is scarcely a mark by which a vessel's approach to the banks on either side may be known, therefore the buoys, and a strict attention to the lead, will be the best guide.

The outer part of the Ooster zand, especially at the Rug-van-den Ooster, is too steep to be closed by the lead, and the south side of the channel is also steep along the Nieuwe sand between the second and fourth white buoys. It is therefore necessary, in either case, to tack before the line of the respective buoys be reached. Above the fourth white buoy, and at the anchorage before referred to, the south shore is shelving, but it is advisable not to approach either side of the gat into a less depth than 4 fathoms.

The width of the channel becomes much reduced near the Schaar of Renesse, to avoid which, on its north side, keep Brouwershaven church in sight to the northward of the trees of Beukelaar, till Renesse steeple bears S.S.W., when the south shore may be approached closely till the vessel has passed Kloosternolle, where the Lange dijk (long dyke) begins. This must be given a berth, and particularly the Ossenhoek, in order to avoid the rocky bank that extends off from it.

Brouwershaven church kept to the southward of the Kloosternolle S.E. ¾ E., will clear the Middel plaat to the south-westward, and Elkerzee steeple S. ½ W., will clear the same bank to the eastward. The vessel may then stretch in over the flat between the east point of the Middel plaat and the west part of the Hompelvoet in 21 to 25 feet water, and, if desirable, anchor near the Middel plaat, with Elkerzee steeple to the southward of Beukelaar, and Brouwershaven church behind the middle of the Lange dijk S.E. ½ S., in 3½ fathoms. Continuing eastward, when Elkerzee appears coming on with Kloosternolle, the west point of Hompelvoet will be neared, the south side of which is very steep, and the soundings cannot be depended upon. The black buoy will, however, mark the southern limit of the shoal, which has generally a ripple over its outer margin.

GOEREE GAT.—The middle of the three outlets of the Maas running between the islands Goeree and Voorne, is known by the name of Goeree gat.

Goeree, which was formerly a distinct island, is now connected with the larger island Overflakkee; it is generally low, with high sand-hills towards its western end, and along the northern face, to as far as Goeree canal, where the shore turns and trends southerly.

Voorne island, like Goeree, is fronted seaward by sand-hills. On the north-east side of the island, is the fortified town of Brielle, the large square tower of the church of which is visible in clear weather at the distance of 16 miles.

HELLEVOETSLUIS, on the south-west side of Voorne island, is a strongly fortified town, with a large excellent harbour, the entrance being between piers extending a considerable way into the river, and being the sea outlet of the Voorne canal, is to Rotterdam what the Helder is to Amsterdam. Here is a royal dockyard, arsenal, ship-building yards, and other establishments pertaining to a naval station. Population, about 3,000.

Time Ball.—In order to facilitate the rating of chronometers at Hellevoetsluis, the instant of mean noon is shown on board the guardship by the dropping of a time-ball from the main topgallant yard. The ball is hoisted half-way from the topsail yard at 5 minutes, and close up at 2 minutes before twelve o'clock, and at the instant of noon, Hellevoet mean time, the ball will be dropped from the topgallant down to the topsail yard.

As the officer counting the seconds guides the line himself, no allowance for loss of time is considered necessary, and the instant of mean noon is that on which the ball leaves the topgallant yard. The longitude of Hellevoetsluis, as fixed by triangulation, is 4° 8′ 0″ East of Greenwich.

Weather Signals are made with a cylinder, a cone, and a sphere. From the offing the cylinder has the form of a square, the cone that of a triangle, and the sphere that of a circle.

The cone with the apex up and the cylinder under it, signifies that a gale may be expected from the N.W.

The cone with the apex down and the cylinder under it, signifies that a gale may be expected from South or S.W.

The cone only, signifies, be prepared, as there is a probability of a gale.

The sphere only, signifies that it will probably blow from the west.

The signals are hoisted from a position where they are visible all day, unless they have to be hauled down to make another signal.

By night these signals will be made by means of three lights on a triangular frame. The apex of the triangle uppermost signifies a gale from the N.W.; the apex down signifies a gale from South or S.W.

VOORNE CANAL.—The entrance of the Voorne canal is just to the eastward of Hellevoetsluis, and from a short distance within the entrance the canal crosses the island in a straight line E. by N. ½ N. By this route vessels may pass at all times in less than four hours from Hellevoet road into the river Maas, 9 miles below Rotterdam. The canal was opened November 1, 1830, and has proved of immense benefit to the trade of Rotterdam, about 3,000 vessels having passed through it annually. It has, in a great measure, superseded the circuitous and intricate passage to the southward of Voorne.

The canal is about 5½ miles long, and has double tide locks at its extremities, 46 feet wide. The depth of water is purposely kept at not more than 17 feet, in order that the canal may carry off the drainage water of the interior of the island, but the level can be easily raised to 20 feet. The width at the surface of the water is 112 feet, and there are four expansions, or sidings, at regular intervals, to enable large ships to pass each other. Vessels of large draught have to lighten after leaving the canal before proceeding to Rotterdam. The canal is crossed by four floating bridges and one drawbridge, and it has a broad towing path on each side.

The canal pilots are furnished with the canal regulations in the French, English, and German languages, for the information of captains of vessels. To these regulations is affixed a tariff of charges for passing through the canal, including lock dues, port money, bridge tolls, &c., the amount of which varies according to the tonnage of the vessel, and the place lately arrived from. Vessels laden with wood or salt passing inward, and vessels in ballast going out, pay only one-half for passing the locks, &c.

LIGHTS.—At the eastern part of the island of Goeree, and 5½ miles from its west end, stands Goedoreede or Goeree church, with a massive hexagonal steeple, one of the principal marks used in entering the Slyk gat; a *fixed* white light is shown from its summit, 148 feet above high water, and may be seen in clear weather at a distance of 18 miles. The light is shaded over a portion of Brouwershaven gat, or between E. ½ N. and E. ½ S. (page 138), and between N.W. and N.E.; it is also coloured *red* in the direction of E.N.E. to N.E. by E., for assisting in the navigation of the now almost useless Noorder Pampus, a channel running obliquely between the shoals near Goeree and Hellevoetsluis.

Yzeren Baak.—Among the downs on the north shore of Goeree, is a small house called Jan Paulus, and about 1¼ miles to the eastward of this, is an iron tower (Yzeren beacon), and also a mast beacon with a diamond head. Upon the iron tower is shown a *fixed* white light 95 feet above high water, and visible in clear weather at a distance of 12 miles from the northern direction, between N.W. by W. ½ W., and S.E. by E. ½ E. Over a portion of this space between the bearings of N.N.W. (westerly) and N. ¾ E. from the tower, or between No. 1 black buoy in the Slyk gat and No. 1 white buoy in Bokke gat, the light is *red*. Goeree and Yzeren beacon lights in line, is the leading mark into the entrance of Slyk gat. To the southward of Yzeren beacon, is the church of Ouddorp, the spire of which has been removed.

Kwade Hoek.—A *fixed* white light is shown from a wooden structure on the downs called Kwade Hoek, at three-quarters of a mile to the north-westward of the entrance of Goeree haven, for leading towards the Noorder Pampus; the light is elevated 115 feet, and can be seen 5 miles in a north-east direction between a S.E. and N.W. by W. ½ W. bearing.

Bokke gat light-vessel moored in the gat near to No. 3 white buoy, exhibits a *fixed* white light at an elevation of 16 feet above the sea. If the vessel (which is painted red) is out of position, the light is not shown, and by day the Dutch flag is hoisted under the ball at the main mast.

Pampus light-vessel placed in the Noorder Pampus East of Garnalen plaat, has two masts, and by day carries a blue flag; by night two *fixed* lights are exhibited, one a little above the other. If the vessel is not in position, the lanterns are lowered, and the lights are not shown; a bell is sounded during fogs.

Kwak Hoek, Voorne, at 1½ miles N.W. of Hellevoetsluis, is a *fixed* light elevated 34 feet, which can be seen 8 miles from the south-west between a N.W. and S.E. bearing.

Hellevoetsluis at the west end of the harbour is a stone tower, which, from an elevation of 49 feet, shows a *fixed* light southward, visible for 12 miles from West to S.E. ½ S.; it is white, except in a westerly direction, where a *red* cut leads across the South (Oude) Pampus: and another *red* sector between the bearings of N.W. ½ N. and N.W., indicaing the positions of white buoys Nos. 9 and 10, on the north-east side of Slyk plaat.

At Middelharnis, on the north jetty, there is a *fixed* harbour light.

At Ooltgensplaat, on the outer slope of mole East of Prince Frederick fort, at the east end of the island, there is a *fixed* light, visible 6 miles.

At Willemstadt, 2¾ miles up channel, from west counterscarp of No. 1 bastion, a *fixed* light is shown, visible 10 miles.

PILOTS.—Goeree pilots cruise in the neighbourhood of Dungeness, as well as to the north-west of Brouwershaven, within range of Schouwen light, and also in the offing abreast the Slyk gat. See page 131.

HOMPEL-EN-BOL (round hump), is the northern boundary of the West gat, which up to a recent date was the principal channel in from sea, but this passage has gradually sanded up, it is still becoming shallower, and the buoys which marked it have been removed. The Hompel-en-Bol lies close in-shore, opposite the north side of Goeree, and may be considered as a projection from Ooster zand.

The Hompel-en-Bol forms the south-west side of the Slyk gat, which latter is bounded by several buoys; going in the black ones are to be left on the port hand, the red and the white ones on the starboard.

Within the Hompel-en-Bol, the shore of Goeree forms the greater portion of the south side of the channel towards Hellevoetsluis, and the last white buoy on that side lies off Kwade Hoek (Bad point), a short distance to the northward of the outlet of Goeree canal, from whence the track to Hellevoetsluis is either by the Noorder Pampus, or by the Zuider diep and Oude Pampus.

Buoys.—As the shoals are liable to constant change, it would only mislead to give all their positions; the Outer buoy of the Hompel-en-Bol is white with a perch, and lies 1½ miles N. ¼ E. from the dunes at Westhoofd, and 2 miles N.W. by W. from the house of Jan Paulus.

HINDER BANK.—An extensive bank named the Hinder occupies nearly the whole space immediately seaward of Goeree and Voorne, and the channels from the sea towards Hellevoetsluis are only shallow swatchways across the lower portions of this bank; its shallowest portions lying lengthways in the direction of the shores, or following the bend of the channels.

This sand forms on its south side with the Hompel-en-Bol and strand of Goeree, the Slyk gat; and the Bollen (which is working north-eastward) on its north-east side with the West plaat (which is increasing near red buoy No. 1) and Honden (seal) plaat, the Noorder gat, or North channel to Hellevoetsluis. A large patch, one mile long and half a mile broad, named the Ribben, forming the inner portion of the sand, dries; to the south of the Ribben, and separated by Bokke gat lies the Garnalen plaat (shrimp shoal), and Tonne plaat; between the body of the sands and the shore of Goeree from the Yzeren beacon, there is, for a distance of nearly 2 miles, only 3 and 7 feet at low water over a great portion of the banks. The north-west or seaward side of the Hinder, lies in an E.N.E. and W.S.W. direction, and the depths decrease gradually towards it, but during dark nights, it is not prudent to approach it into less than 6 fathoms.

Buoys.—The Ribben buoy for the Noorder gat and West Maas, on the outer edge of the northern end of the bank, is a white Herbert with a red ball surmounted by a red triangle, it lies in 5 fathoms water with Goeree lighthouse in line with the east side of the westerly wood. The outer light-vessel of Bokkengat lies on the same line. A large buoy chequered black and white lies in 21 feet water off the west end of the Hinder, with Goeree light-tower S.S.E. ¾ E., and the Westhoofd S.S.W. ¾ W. A large chequered black and white buoy with mast and ball is moored in 23 feet water off the entrance of Slyk gat to the south-west of the Hinder; N.N.E. ¾ E. one mile from the Outer white buoy of the Hompel-en-Bol, and with Goeree tower in line with Yzeren light beacon S.E. ½ E. A black buoy lies to the southward of the outer part of the Hinder bank in 16 feet water at nearly 1¾ miles E. by S. ¼ S. from the Slyk gat outer chequered beacon buoy, and 2 miles N.W. by N. from Yzeren light beacon. Black buoys are also placed on the southern edge of the Tonne and Garnalen plaats, and mark the north side of the Slyk gat.

SCHEELHOEK BANK is a continuation of the Hinder to the south-eastward, and extensively occupies the space between Goeree and Hellevoetsluis; the several passages going by the Slyk gat towards the latter place, are named the Noorder Pampus, which is much deteriorated, Zuider diep, and Oude Pampus, passing the north, south-west, and south sides of the sand. A large portion of the Scheelhoek dries at low water, and its east and west sides are very steep.

Buoys.—All these passages are more or less buoyed, they are laid down on the same principle as before mentioned, but, liable to constant changes, their positions are not given to prevent misdirection.

Black buoys are placed along the south-west and south sides of the Scheelhoek and mark the Zuider diep.

The Oude Pampus (page 148) is marked by a black buoy at the south-east end of the Scheelhoek, and a white buoy with a mast on the west extremity of the Zuidwal.

SLYK PLAAT is above, and in continuation of the Scheelhoek; it is equally extensive, a portion of it dries, and over a great part of the remainder a flat bottomed boat cannot pass at low water. It is at present rather closer to the shore of Voorne than to that of Over Flakkee, from the first island it is separated by the Haring Vliet. Both the Scheelhoek and Slyk plaat are subject to frequent changes as respects shape as well as height. The north part of Slyk small plaat forms the south boundary of Hellevoetsluis road, and then the eastern side of the sand, which is steep, trends nearly direct for the jetties of Middelharnis harbour.

The western end of the Slyk plaat, named the Zuid wal, forms the south side of Oude Pampus; the north-east side of the plaat, and its eastern end are marked by white buoys.

SLYK GAT and CHANNELS to HELLEVOETSLUIS.—Both the West and Slyk gats, as has been already noticed, are only swatchways across the bounding flats of the entrance. The breadth of the Slyk gat is rather over a mile at its outer part, but the Hompel-en-

Bol running nearly parallel to the shore narrows it to not more than half a mile. There was 16 feet at low water in the shoalest parts of the gat in 1874, up to the inner part of the bar, where, at about half a mile off shore, opposite Ouddorp or East dunes, the depth quickly increases to 4 and 5 fathoms, but the channel is very narrow to Kwade Hoek, being confined between the ends of the jetties from the shore of Goeree, and the edge of Tonne plaat.

Abreast Kwade Hoek is the Noorder Pampus, a swatchway between the Hinder and Scheelhoek, which is not now serviceable. The remainder of the channel between Scheelhoek and the shore of Voorne is half a mile wide, with 4½ to 7 fathoms in it.

The Zuider diep, beginning at Kwade Hoek, off which a shallow spit extends, is confined between the shore of Goeree to the westward, and the steep western edge of the Scheelhoek to the eastward; it is narrow and deep, and curves gradually from the southward to the south-eastward, and is defined by black buoys on the Scheelhoek, and stakes on the shore of the island. The Zuider diep continues between the flats which border Overflakkee in front of Dirksland and the south-west side of Slyk plaat, but its only outlet in that direction is by narrow swatchways, which are constantly changing, between the plaat and Middelharnis harbour; Pieter beacon with a triangular head marks the entrance to Dirksland haven, and a light that of Middelharnis. The Zuider diep is, however, connected with Hellevoetsluis road by the Oude Pampus, the swatchway between the Scheelhoek and Slyk plaat, in which there are 8 to 10 feet at low water, but encumbered with a shoal patch having only 5 feet water, in about the middle of it.

BOKKE GAT between the Ribben sand on the north and Garnalen and Tonne plaats on the south, and leading nearly direct to Hellevoetsluis, with depths varying from 2½ to 7 fathoms in its centre, but having only 12 feet at low water on the bar at its outer entrance. This gat like all the others is liable to change.

Buoys.—Bokke gat is marked by a number of white buoys on its south side and black buoys on its north. A white buoy No. 1 with a staff and ball is placed in 11 feet water near the west end of Garnalen plaat, N. ¾ E., distant 1¾ miles from Yzeren light beacon, and E. ⅔ S., 3¾ miles from the Outer chequered beacon buoy of Slyk gat; the other white buoys are on the north edge of Garnalen plaat, and farther on they are on the east side of the Scheelhoek. No. 1 black buoy bears about N.W. half a mile from No. 1 white beacon buoy, and the other black buoys follow the south side of Ribben plaat and the west edge of the bank which borders the shore of Voorne island, a bell buoy lying off Kwak, with Hellevoetsluis lighthouse bearing S.E. by E. 1¼ miles. A red buoy marked No. 5 has been placed at the point of divergence of Bokke gat and the Noorder or Nienoe gat, in order to indicate both channels.

TIDES.—It is high water, full and change, at Goeree gat, at 2h. 0m., springs rise 7¼ feet, and at Hellevoetsluis at 2h. 30m., springs rise 5½ feet.

In all the channels the flood of common tides runs a little more than 4 hours, while the ebb runs for fully 8 hours; the water continues to rise only 3 hours during the flood, and with the ebb to fall about 7 hours, so that during the last hour of both flood and ebb, the stream runs with but little apparent variation in the depth of water.

About Goeree with a quarter moon, the tide usually rises 5½ feet. Upon an average the water does not rise during the first hour and half of flood more than one-fourth of its whole height; it attains its highest point during the succeeding two hours, and remains nearly at that level until the ebb makes. During the first two hours of the ebb, the water does not fall more than at the rate of about 10 inches in each half hour, after which it falls about one foot in the same space of time, till towards the last of the ebb, when the fall is again 10 inches per half hour, Sometimes, however, owing to prevailing winds, the tides rise and fall with less regularity, particularly off Goeree, and the same cause will also influence their direction and velocity. With northerly and westerly winds, the flood runs longer and rises higher, while southerly and easterly winds equally affect the ebb.

Respecting the tide streams.—The ebb tide of the river meeting the tide of the North sea (which runs athwart the mouth of the channels). usually causes a remarkable rippling, and the junction of the two streams of tide may be also discerned from the difference in colour of the river and sea waters. With strong westerly gales this disturbance approaches nearer to the edge of the bank than when the wind is blowing off the land.

The flood stream along the coast sets from the west end of Goeree, and follows, in part, the direction of the outer edge of the Hinder bank, or about E.N.E., but off Goeree, the first of the flood sets off shore. In the channels the flood stream runs thus:—Following the line of the Ooster bank and Hompel-en-Bol, it enters the Slyk gat, and continues in an easterly direction as far as to where Goeree church appears in line with Oosternolle; it then runs more south-easterly to where that church shows in line with the third jetty head (reckoning from the eastward), whence it has a direct S.S.E. course. The flood sets through the Oude Pampus.

From the entrance of the Noorder gat to where Goeree church appears in line with the Kroonbon, the flood runs S.E. by S., and then dividing, one stream runs S.E., crosses the Hinder over the Ribben, and sets slowly towards Kwade Hoek, until at Tonne plaat, having united with the flood running up Slyk gat, it sets strongly upon Kwade Hoek, as well as upon the shore to the eastward of Goeree canal, as far as Stellendam. The other stream of flood, running between the banks, follows the bend of the north side of the Pampus, S.E. by S., until off Hellevoetsluis, where it turns two points more easterly.*

DIRECTIONS to HELLEVOETSLUIS ROAD.—In heavy weather, a vessel having the choice of entering Brouweshaven gat, should not attempt that of Goeree. No stranger should willingly enter without a pilot. One can generally be obtained at sea, and always from within the bar.

By the Slyk gat.—Vessels waiting tide to enter the Slyk gat usually anchor outside the outer or fairway buoy, in 6 or 7 fathoms, with Goeree church open to the eastward of Yzeren beacon bearing S.E. ¼ E.; or, should circumstances render it necessary to continue under way, then keep Goeree church between Jan Paulus house and the mast beacon bearing respectively S.E. by E. ¾ E. and S.E. ¼ E., and do not go into a less depth than 7 fathoms. In approaching the gat from the offing, keep Goeree church bearing S.E. ½ E., and it will lead to the outer or fairway buoy.

Entering the Slyk gat on an emergency without a pilot, the seaman should know what tide is running; during westerly gales, however, this is not so necessary as regards the height of the water, for it is then so pent up at the mouth of the gat, that there is scarcely any perceptible fall during the ebb. This is the case only when storms from the westward have lasted a couple of days or more.

The leading mark through the entrance of the gat differs according to the wind. With northerly winds, keep Goeree church in line with, or to the eastward of either Yzeren or the mast beacon S.E. ¼ E., but as this course would, if continued, lead across the tail of the Hompel-en-Bol, and to the southward of the deepest water over the bar, when Jan Paulus' house bears S. by E. steer up about E.S.E. for 3 miles to within the bar, leaving the black buoys on the port hand. With a southerly wind, and especially with a flood tide, keep Goeree church on with or to the southward of Yzeren beacon S.E. ¾ E.; this will lead up to the outer chequered black and white beacon buoy, from which an E.S.E. course for 4 miles will lead up to within the bar.

Within the bar, the water quickly deepens in what is still termed the West gat, and the vessel after following along the land for a short distance, will proceed with the black buoys on the port hand as usual, but caution must be observed, as the channel is little more than a cable's length across, and is, in some places, very steep, so that if the buoys should have been driven away, it will require no common vigilance in a stranger to thread such a narrow channel by his lead. The course continues E. by S. ¾ S., and then more southerly as the water deepens, and the jetty heads or groynes along the south shore may be more nearly approached, until near Kwade Hoek, when the vessel must haul out more easterly to pass close to the white buoy which marks that danger, and also because the flood stream sets strongly upon the shore.

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* The same remark with reference to the tidal set, as made on page 137 applies here and other places where considerable changes have taken place in the banks.

Having rounded the white buoy proceed about S. by E. ¼ E. to abreast the dyke-heads of Goeree canal at the distance of 2 cables, the course through the Zuider diep in continuation from the West gat, changes gradually from S. by E. to S.E. by E. ¾ E., following the inward curve of the shore of Over Flakkee. No marks for this portion of the navigation can be given, but the vessel should pass a cable's length to the westward of the successive black buoys upon the edge of Scheelhoek, until the spire of Oudenhoorn church appears open to the southward of the pier-heads of Hellevoetsluis harbour. The lighthouse on the pier-head bearing about E. by N. ½ N., leaving the black buoys on the port hand leads through the Oude Pampus in the deepest water, and up to Hellevoetsluis road, where anchorage may be taken anywhere between the shore and the white buoys on the north side of the Zuid wal in a depth of 9 or 10 fathoms. The best parts of the road are on the east and west sides of the harbour, but right in front of the pier-heads the bottom is soft, and rendered foul by sunken wrecks, and ships are annoyed by eddies. With this exception the ground in the road is good, and there is room enough for 100 sail to ride in comparative security, but the anchorage is subject to the drawbacks of being exposed to westerly gales and the strong flood tides produced by them, and in the winter to the drift ice of the river; these inconveniences have been, however, in a great measure remedied by the construction of the Voorne canal.

To pass from the Slyk or West gat to Hellevoetsluis road through the Noorder Pampus, which is now almost closed, from a position midway between the black buoy on the south-east spit of Tonne plaat and the white buoy of Kwade Hoek, with Goeree church bearing about S.W. by W., steer so as to make good an E. by N. ½ N. course, which will lead over the irregular flat connecting the Hinder with the Scheelhoek; or bring Kwade Hoek lighthouse in line with Goeree bearing S.W. by W. ½ W. it will lead through the middle of Noorder Pampus. Having arrived in the deep water of the north channel between the shore of Voorne and the Scheelhoek, steer S.S.E. ½ E., and then a more easterly course between the white buoys marking the east edge of the sand, and a black buoy lying upon the outer edge of the flat from Voorne a mile to the north-west of

Kwak Hoek. Proceeding on, leave on the port hand the black bell buoy in front of Kwak Hoek in order to avoid the flat, and when this has been passed steer direct for Hellevoetsluis road or harbour.

Approaching Hellevoetsluis road from the eastward, on entering the red sector of Hellevoetsluis light it indicates the vessel's approach to No. 10 white buoy on the north-east side of the Slyk plaat, and that a more westerly course may be shaped; when the light again changes to white the vessel is northward of white buoy No. 9.

By Bokke gat.—Having arrived at the outer fairway buoy of the Slyk gat (page 144,) steer about E. ½ S. between the black buoy and No. 1 white beacon buoy of the gat until near the light-vessel, when a S.E. by E. ¼ E. course will lead through the black and white buoys to the Noorder Pampus light-vessel, and into the deep water between Voorne and the Scheelhoek, and when Kwak Hoek and Hellevoetsluis lighthouses are in line proceed for the road as previously directed.

The Noorder gat, formerly one of the principal passages towards Hellevoetsluis, between the north-east side of the Hinder and the eastern shore of Voorne, has been gradually closing of late years, and as it is still sanding up with but 8½ feet water on the outer bar further reference to it is needless.

At night.—As the leading lights are only available for a part of the way through Slyk gat, it should never be attempted at night, except in case of emergency. By keeping Goeree and Yzeren lights in line bearing S.E. ½ E. they will lead to the outer fairway chequered buoy of Slyk gat, and the *red* sector of Yzeren light shows between No. 1 black buoy of Slyk gat and No. 1 white beacon buoy of Bokke gat. It may be mentioned that, besides the floating light in the Noorder Pampus, a *red* light is shown from Goeree tower, the western limit being on about the same line of bearing as Kwade Hoek light S.W. by W., and the eastern W.S.W.

For the Oude Pampus a *red* cut is shown from Hellevoetsluis tower which directs through the deepest water, care being taken not to open the white light on either side.

Strangers without a pilot should not attempt the Bokke gat by night if they can avoid doing so. When near the outer fairway buoy of Slyk gat the Bokke gat light-vessel will bear about E. ½ S., an E. ¼ S. course will then lead into the gat; having crossed the *red* sector of Yzeren light the light-vessel may be brought to bear E. by S. southerly and steered for; from near the light-vessel a S.E. by E. ¼ E. course leads through the remainder of the gat into the deep water between Voorne island and the Scheelhoek, with Goeree light showing *red* and Kwak Hoek and Hellevoetsluis lights in line.

CHAPTER VI.

GOEREE TO THE TEXEL.

VARIATION 16° 42′ West in 1878.
Decreasing 9′ annually.

The BRIELLE GAT.—The northern and principal channel of the Maas, the direct outlet of the river, between Voorne and the Hook of Holland, is indifferently termed the Brielle gat and Maas flats. Voorne has been already described (page 140) as a low island fringed with sandhills on its seaward, or west and north sides, and principally distinguished by the massive tower of Brielle church, from the top of which a light was formerly shown. The Steen beacon also stands at the north-east part of the island.*

Brielle gat had in December 1877, 6¾ feet depth over the bar at low water of ordinary spring tides, but within it the soundings increase to 9 and 13 feet in what is termed the Pit, and then the channel, less than a quarter of a mile wide between the shore of Voorne and the Binnen Vlakte, has an East direction until about midway between Zeeburg and the beacon, where it turns off E.N.E. between the Zuider and Noorder banks, the former with white and the latter with black buoys along its edge. Here the channel becomes very narrow, and following the side of the Zuider bank its direction changes to E.S.E., S.E., and South between the Krabben plaat and the shore; and, lastly, a little easterly towards the lighthouse at the entrance of Brielle haven.

BRIELLE is situated on the northern part of Voorne island, about 6 miles within the bar of the West Maas channel; it is strongly fortified. All vessels that are able to cross the bar can reach this place. The northern entrance of the Voorne canal is 3⅛ miles above Brielle.

LIGHTS.—**Steenen Baak** light is *fixed* and visible for a distance of 4 miles.

Brielle.—At the north mole there is a *red* and white light, visible 4 miles.

At Nieuve Sluice there is also a light at the entrance of the Voorne canal.

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* *See* Admiralty chart:—Mouths of the Maas, No. 122; scale *m* = 1·0 inches.

Life Boat.—At Langedoen, between Zeeburg and Steenen Baak lighthouse, there is a life-boat station.

MAAS FLATS.—The flats of the Maas extend 4 miles seaward of Voorne island, and the channels across them are not only shallow, but are subject to constant change during gales of wind.

The sands bounding the passage are both extensive and complicated, and can be described only in general terms. The entrance to Brielle gat is between the West plaat and the Zeehonden plaat or Schaar ; the former shoal, with 2 to 4 feet upon it, projects 3 miles north-westerly from the north-west part of Voorne, and, with Zeehonden plaat, separates the channel of the Maas from the Noorder gat, (page 143). The Maas bank, nearly dry in places, extends 1½ miles south-west from the Hook of Holland. Within these shoals the channel of the Maas is confined between the shore of Voorne and a flat projecting from it near the beacon to the southward, and the Binnen Vlakte (inner flat) and flats from Rozenburg island to the northward and eastward.

The Maassluice gat is a small swatchway close under the Hook of Holland, with 5 feet water at its southern end.

Buoys.—The gat and the channel as far as Brielle are buoyed as usual with black buoys on the eastward or port hand, and white buoys on the westward or starboard hand. The West Maas outer buoy, lying in 20 feet in the fairway of the entrance to the gat, is black, with flag. From it Brielle appears a little south of Oostvoorne church S.E. by E., and Goeree appears open to the east of Groote wood S. by W. ½ W. On the flat immediately outside of Brielle gat bar there is a red nun buoy with staff and ball. The Ribben beacon buoy, on the outer part of the Hinder, is given on page 143. As these other buoys are altered with the changes in the banks, and their present position might continue for a very limited and uncertain time, it would be useless to describe them further.

From in front of Zeeburg church, the south side of the channel, as far as the beacon, is formed by the shore of Voorne. Above the beacon, the channel, narrow and circuitous, is marked by black and white buoys at short intervals.

TIDES.—It is high water, full and change, at Brielle gat at 2h. 30m., and at Brielle at 3h. 0m. ; springs rise 5 feet ; at Rotterdam at 3h. 45m. ; springs rise 7 feet.

In the channel the flood of common tides runs for little more than 4 hours, and the ebb runs fully 8 hours, but during the last hour of both flood and ebb, the stream runs with but little apparent variation in its height.

On Brielle bar, with a quarter moon, the tide usually rises about 5 feet. The average rise during the first hour and half of the flood is not above one-fourth of the whole height which it attains during the next

HOOK of HOLLAND CANAL.—The difficulties and dangers attending navigation owing to the shoals which encumber the mouths of the Maas, decided the government of Holland to cut a canal across the Hook to the river Scheur, and in 1872 it was sufficiently advanced to allow a steamer drawing 13 feet to pass through at high water. The canal is sheltered at its seaward entrance by two jetties which project at nearly right angles from the shore, and forms a new communication from the sea to Rotterdam. Between the 1st January and 1st August 1873, the number of sea going steamers and sailing vessels which made use of the canal was 2,568, independently of about 600 fishing and other small craft.

LIGHTS.—Hook of Holland Canal,—1. Two *fixed* white leading lights, the upper S.E. ½ S., 288 yards from the lower, are exhibited from the sand-hill on the south shore of the canal.

2. Two *fixed red* lights are exhibited on the north shore of the canal, near the Krimsloot, eastward of the harbour of refuge, the lights bear from each other S.E. ¾ E. and N.W. ¾ W., and are 143 yards apart.

3. Two *fixed* white lights on the north shore of the canal, bearing from each other N.N.W. ½ W. and S.S.E. ½ E., distant 295 yards.

4. A *fixed* white light is shown from the north mole head when the state of the sea admits.

5. On the centre of the south mole is exhibited a *fixed red* light shewing seaward, and changing to white within black buoy No. 3.

6. A *fixed red* light is shown on the south shore of the canal, near Scheur mole.

The white lights should be visible in clear weather from a distance of about 10 miles, and the red lights from about 4 miles.

At **Vlaardingen,** on the north bank of the Nieuw Maas, 1½ miles above Rozenberg, is a *fixed* white light.

At **Pernis** on the south bank, and at Schiedam on the north, a *fixed* white light is exhibited at each place.

Buoys and Beacons, the Fairway buoy is a white conical buoy with a staff and black vane, having "*Hoek van Holland*" in black letters painted on it. It lies in 9 fathoms water, about 4 miles from shore, and bears N.W. ¾ W. from the red light on the south jetty.*

Going into the canal, black buoys mark the port side of the entrance, and white buoys mark the starboard side. A wreck buoy painted in black and white squares is moored 65 feet N. by W. from the wreck of the "Lodewijk." Beacons surmounted by balls are placed along the north jetty.

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* Three temporary buoys (1878) have been moored in 7½ fathoms, at 3½ miles from the shore, in connection with the dredging operations.

two hours, and at which point it remains until the ebb makes. During the first two hours of the ebb the water does not fall more than at the rate of about 10 inches in each half hour, it then falls about one foot in the same space of time until towards the latter part of the ebb, when the fall is again 10 inches per half hour.

Along the coast the flood sets E.N.E. until opposite Brielle bar, when it runs N.E., following the bend of the Hook of Holland. Outside Maas bank the first of the flood sets on the shore, except during southerly winds, when it generally sets off, so that with a strong breeze from that quarter the buoys upon the shoals of the Maas scarcely change their north-easterly drift or trend.

On the flats of the Maas, the early flood sets in upon the north-east side of the Zeehonden plaat, and thence towards Kwaps diep (the old channel now closed up); after having run about an hour in this direction, the stream turns suddenly, and runs N.E. to as far as where the Steen beacon of the Brielle appears in line with Zeeburg; it then has a more easterly direction, following the line of the coast until it splits, one branch running into the Zuider bank channel, and the other into the old channel of the Noorder bank.

DIRECTIONS.—Brielle bar can at present be crossed at high water by vessels drawing 9 to 11 feet, and such are in the habit of using it, to avoid the expenses of Voorne canal. The North channel along the west side of Maas flat, is now blocked up, and there is consequently, only one passage over Brielle bar, instead of three as formerly. Though there is but little difference in the depth of water over the whole breadth of this passage, yet there is rather more water on the side of the black buoys than on that of the white buoys. The tide stream setting across the outer part of Maas flat renders the passage of Brielle bar difficult with some winds.

The leading mark towards the red beacon buoy and over the bar is Oostvoorne church, bearing S.E. by E. ½ E. The course will then be between the buoys. The shifting nature of the banks, however, renders the employment of a pilot advisable.

In the Pit, the channel, especially on the south side, is steep, and the beacon must be kept open to the northward of Zeeburg. Having arrived nearly up to the beacon, haul off from the strand: from thence to Brielle the channel is narrow and winding, and the sides are steep, and the vessel will proceed with the black buoys on the port hand and the white buoys on the starboard hand. When near Brielle haven, anchorage may be taken up a little below Ferry pier.

The principal channel up to Rotterdam is by Brielle and the south side of the island of Rozenberg: north of the Binnen Vlakte and the island, is a circuitous channel named the Pan, bounded at the entrance by the Vlakte and the Hook of Holland.

HOOK of HOLLAND CANAL.—The difficulties and dangers attending navigation owing to the shoals which encumber the mouths of the Maas, decided the government of Holland to cut a canal across the Hook to the river Scheur, and in 1872 it was sufficiently advanced to allow a steamer drawing 13 feet to pass through at high water. The canal is sheltered at its seaward entrance by two jetties which project at nearly right angles from the shore, and forms a new communication from the sea to Rotterdam. Between the 1st January and 1st August 1873, the number of sea going steamers and sailing vessels which made use of the canal was 2,568, independently of about 600 fishing and other small craft.

LIGHTS.—Hook of Holland Canal,—1. Two *fixed* white leading lights, the upper S.E. ½ S., 288 yards from the lower, are exhibited from the sand-hill on the south shore of the canal.

2. Two *fixed red* lights are exhibited on the north shore of the canal, near the Krimsloot, eastward of the harbour of refuge, the lights bear from each other S.E. ¾ E. and N.W. ¾ W., and are 143 yards apart.

3. Two *fixed* white lights on the north shore of the canal, bearing from each other N.N.W. ½ W. and S.S.E. ½ E., distant 295 yards.

4. A *fixed* white light is shown from the north mole head when the state of the sea admits.

5. On the centre of the south mole is exhibited a *fixed red* light shewing seaward, and changing to white within black buoy No. 3.

6. A *fixed red* light is shown on the south shore of the canal, near Scheur mole.

The white lights should be visible in clear weather from a distance of about 10 miles, and the red lights from about 4 miles.

At **Vlaardingen,** on the north bank of the Nieuw Maas, 1½ miles above Rozenberg, is a *fixed* white light.

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Buoys and Beacons, the Fairway buoy is a white conical buoy with a staff and black vane, having "*Hoek van Holland*" in black letters painted on it. It lies in 9 fathoms water, about 4 miles from shore, and bears N.W. ¾ W. from the red light on the south jetty.*

Going into the canal, black buoys mark the port side of the entrance, and white buoys mark the starboard side. A wreck buoy painted in black and white squares is moored 65 feet N. by W. from the wreck of the "Lodewijk." Beacons surmounted by balls are placed along the north jetty.

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* Three temporary buoys (1878) have been moored in 7½ fathoms, at 3½ miles from the shore, in connection with the dredging operations.

ROTTERDAM, the second city of Holland, both in point of commerce and population, is upon the right bank of the Merewede, or Nieuw Maas, 17 miles above the entrance of the canal. It is in the form of an isosceles triangle, the base and largest side of which is next the river; the sides landward are bounded by the old fortifications. Like most Dutch towns, Rotterdam is extensively intersected by canals, some of which, from their ample width, might be termed havens, and several of them are deep enough to admit large vessels to lie alongside the warehouses in the middle of the town. These canals afford shelter when ice is in the river. Along the river-face is the fine quay called the Boompjes (little trees), 1¼ miles long, the channel in front of which carries 5 to 6 fathoms water.

A double row of buoys are moored in a sufficient depth of water to allow ships of any size and draft to lie afloat with access to both sides for lighters to come along-side. Steam tugs are always at hand to assist or move vessels.

At Charlois, on the opposite side of the river to Rotterdam, there is a floating dock with an area of 15,158 square feet, which will admit vessels drawing 12 feet water, with a small basin capable of receiving two or three large ships.

At Rotterdam, Charlois, and the vicinity there are several large ship-building yards, where vessels of 1,000 to 1,500 tons are built; also extensive factories for steam and other engines. At Feymoord, just opposite the city there is a large establishment where most of the government steam-vessels, also several monitors have been built and fitted with engines, &c. All of these yards have slips for repairing river steamers and small craft. Up the river there are numerous smaller ship-building yards and manufactories within easy reach of the city.

Rotterdam has no graving dock, but there are four patent slips near it. One at Delfshaven with a cradle 200 feet long and capable of bearing a ship of 2,000 tons; one just opposite the city with a cradle 180 feet long, and able to take a ship of 1,500 tons; one at Schiedam, about 3 miles below the city, which can take a ship of 2,000 tons; and one at Papendrecht, capable of bearing a ship of 1,600 tons.

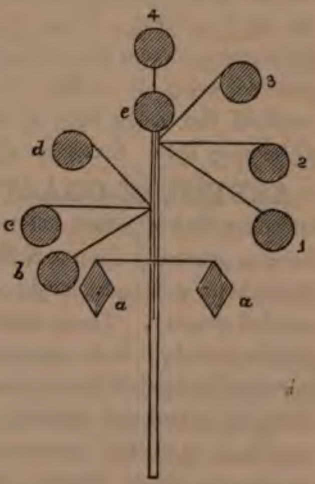
The inhabitants of Rotterdam, who numbered 118,575 in 1870, are chiefly engaged in commerce, which is divided into three sections,—the foreign, Rhine, and inland trades. During the union of Holland and Belgium, the prosperity of the city received a check from a great portion of its foreign trade being diverted into Antwerp; since the separation of the two countries, however, the trade of Rotterdam has resumed its former importance. It sends to the Dutch eastern possessions, and to the West Indies, provisions of various kinds, spirits, wines, mineral waters, and manufactured goods,—in return for coffee, sugar, spices, cotton, dye-woods,

&c. To England and Scotland, with which it carries on an extensive and lucrative trade, it sends cheese, butter, flax, linseed, madder, garden seeds, gin, clover seeds, fruits of various kinds, poultry, and large numbers of cattle and sheep. A good trade is also carried on with America, France, Spain, Portugal, and the Northern States of Europe. Steam communication is maintained with London, Leith, Hull, Yarmouth, Dunkirk, Havre, Antwerp, and other parts. There are eleven steam-towing companies.

In 1869 the total number of vessels which entered and cleared the port was 16,709, of 4,166,195 tons. Besides its extensive commerce, Rotterdam has 42 distilleries, several breweries, and vinegar works, tanyards, candle and dye-works, sugar-refineries, bleach-fields, corn, oil, trass, snuff, and saw-mills, a shot factory, and several ship-building yards. The town is connected by railway with Amsterdam, 38 miles N.N.E., Utrecht, Antwerp, and thence to all parts of the continent.

HOOK OF HOLLAND CANAL.—Tidal Signals.—The following signals have been established at the Hook of Holland to denote the depth of water in the canal, viz. :—

		ft.	in.	
1	when there is	6	5	in the channel.
2	,,	9	2	,,
3	,,	9	10	,,
4	,,	10	6	,,
4 *a*	,,	11	2	,,
4 *b*	,,	11	9	,,
4 *c*	,,	12	5	,,
4 *d*	,,	13	1	,,
4 *e*	,,	13	9	,,
a	,,	14	5	,,
a a	,,	15	1	,,
2 *a a*	,,	15	9	,,
3 *a a*	,,	16	3	,,
4 *a a*	,,	17	0	,,
4 *e a a*	,,	17	9	,,
d 3 *a a*	,,	18	4	,,
c 2 *a a*	,,	19	0	,,
c 2 *a*	,,	19	8	,,
c 2	,,	20	4	,,



The signal *a*, *a a*, and a black triangle at one of the horizontal yard-arms, denotes that it is unadvisable to take the channel.

Whenever the south mole-head is inaccessible owing to bad weather, the signals indicating the depth of water upon the shoal fronting the canal, will be exhibited from the signal-mast placed on the sand-hill to the north of the lighthouse keeper's dwelling on the south side of the canal.

In observing the directions respecting the depth of water it must be particularly remembered that they are issued no longer with reference to the depths ascertained on the line of the leading lights, but with reference to the depth along the black buoy side.

DIRECTIONS for Hook of Holland canal.—Coming from sea the two *fixed* white leading lights on the south side of the canal in line S.E. ½ S. lead 109 yards south-westward of the northern mole head, and to the position of white buoy No. 4, carrying from 10 to 10¾ feet at low water. September 1877. When the *red* light on the centre of the south mole bears S.W., the two *fixed red* lights on the north shore of the canal in line bearing S.E. ¾ E. will lead through the Keel or Benedenmond (lower mouth) until off the eastern of the two white lights on the north shore of the canal, these two fixed white lights in line N.N.W. ½ W. lead through the Bovenmond (upper mouth), north-westward of the Scheur, but at their point of intersection with the line of the two red lights, the northern bank requires further cutting away before these marks can be used.* As the outer ground fronting the navigable channel continues to work towards the north, outside the jetties (dams), it results that the actual channel on the bar is narrow. With bad weather and a high sea, it is advisable, in order to enter from the north, to take the head of the north jetty as close as possible, using all needful caution in doing so. Vessels must keep to the north of the wreck buoy of the Lodewijk, and not pass between it and the white buoy side. Strangers should always, if possible, employ a pilot.

ASPECT of COAST.—From the Hook (Hoek) of Holland an unbroken line of coast extends for 66 miles to Kykduin near the Texel, curving gradually from a N.E. by E. to N.E. by N. direction, and presenting throughout a broad margin of sand-hills, bounding a low and thickly-wooded country. These sand-hills protect the country from inundation by the sea, which, it is an interesting fact to remember, has assisted in raising this barrier against its own encroachments: the sand is said to be gaining slowly in extent and stability seawards. The only objects which now and then tend to relieve the monotony of the scene for many miles are, the steeple of a village church, with its bluff top or diminutive spire showing above the downs, some beacons, and some fishing boats drawn up upon the beach. It is worthy of remark, that along the whole of this extent of coast not the smallest portion of rock is found, and there is only one sand-bank, the Polder of Petten, detached from the shore. On the other hand, the coast is shallow throughout, and to maintain an average depth of 7 fathoms it is necessary to keep an offing of 2 miles.*

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* Cutting away the banks progressing in December 1877.

The following is a running description of the several objects, as they occur between the Hook of Holland and Kykduin, and which are useful in distinguishing the coast.

Monster, about 6 miles from the Hook, has a massive square tower; Ter Heyde, near Monster, is a small village close to the shore, and 3¾ miles to the north-east of the Hook of Holland canal; and Loosduinen, about 3 miles to the E.N.E., has a tower of similar character, with a small turret upon it.

Scheveningen, a bathing village in connexion with the Hague, (Gravenhage) which is only 2 miles distant, has, owing to its vicinity to the royal residence and the seat of government, become a place of considerable importance; it stands close upon the shore, and its church has a tower surmounted by a spire. Extensive bath-houses and the king's pavilion are on the sand-hills just to the eastward of the village; and its numerous fishing vessels, of which it possesses upwards of 150, form at times a marked feature on the shore: the steeples of the Hague are also visible behind.

Rhine river.†—Katwyk, 7 miles to the northward of Scheveningen, at the mouth of the river Rhine, has to the southward of it an extensive bathing establishment; the church, with a tower surmounted by a small spire steeple, is a large white building. Between Scheveningen and Katwyk the steeples of Wassenaar, Volkenburg, and Katwyk-binnen (Inner Katwyk) may occasionally be seen.

Noordwyk, 3½ miles from Katwyk, has a church with a belfry and a high-pitched roof. Noordwyk-binnen, close within it, has a massive square tower and stunted spire, and a small pinnacle about the middle of the roof of the nave. A small conical roofed building like a summer-house stands on the summit of a high sand-hill, a mile to the south-west of the village. The hummocks on the land here appear somewhat higher than those southward.

Zandvoort, nearly 9 miles from Noordwyk, has a church with a sharp spire, and a large white hotel with wings and outbuildings, which bears, when in line with the church, S.E. by E. ½ E. The steeples of Haarlem are nearly always visible inland of Zandvoort. A telegraphic cable extends from Zandvoort to near Dunwich in Suffolk.

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* *See* Admiralty chart:—North sea, No. 2,182A.; scale, *m* = 0·1 of an inch; Dover and Calais to Orfordness and Scheveningen, No. 1,406; scale, *m* = 0·1 of an inch; also Zuider zee, No. 2,322, scale *m* = 0·5 an inch; and plan of Texel, No. 124, scale *m* = 2·3 inches.

† The navigable portion of the river Rhine in connexion with Cologne is entered at Rotterdam, but in June 1877, it was not safe for vessels drawing more than 7½ feet water to proceed to Cologne, and the depth was not expected to increase for the next few weeks. Between Rotterdam and Cologne are five bridges, the first being at Bommell (on the Waal), about 35 miles above Rotterdam. Vessels must lower their masts and funnels to a height not exceeding 30 feet above the water.—Letter from British Consul, June 25th, 1877.

Noordzeehaven* (Ymuiden).—Between Zandvoort and Wyk-aan-zee, about 5 miles from the former, is Noordzeehaven or the outer harbour of the entrance of the North sea canal. *See* page 159.

Wyk-aan-zee, 7½ miles to the northward of Zandvoort, is distinguished by a sand-hill higher than the coast about it; this hill, when on an East bearing, or nearly abreast, has the tower of Wyk-aan-zee church showing over it. The land here appears double, and is distinguishable when coming in from sea, by Haarlem church, which stands about 4 miles in the interior, with a spire steeple in the middle of it, and also by the church of Beverwyk, 3 miles inland, with a tower topped by a dark coloured spire.

As the light-towers at Egmond sometimes show very indistinctly on account of the whiteness of the sand-hills in the back-ground, there has been erected on one of the highest sand-hills a short distance to the southward, a wooden beacon, the square head of which is 80 feet higher than the lighthouses; by this means, the land about Egmond has been rendered the most conspicuous part of the coast, and thus serves an invaluable purpose to vessels bound to the Texel, &c.

At Kamperdown, 6 miles to the northward of Egmond, the downs are higher than those on either side, and they may be seen at an offing of 20 miles, where the depth of water is 14 fathoms. The Kamperdowns, also called the Schoorldowns, from the village of Schoorl near them, have not the same white appearance which characterises the sand-hills on the other parts of the coast; the darker colour of the former is due to the sand reed growing on them being much broader than elsewhere on the coast. Between the Kamperdowns and the village of Petten is an interval in the line of sand-hills, and the land is here protected from the sea by a dike, named the Hondsbossche Zeewering. Petten church with a small spire, and having some houses and windmills a short distance to the southward of it, stands where there is a wide gap in the downs. Close to Petten is a sand-hill, upon which will be seen, when abreast of it, a large building like a lighthouse.

Calandsoog is seen through a wide opening in the downs; the steeple of its church appearing on with the southern slope or toe of the sand-hills to the northward of the village, serves as a useful mark to vessels rounding the Haaks. It is to be regretted that, on account of its value for this purpose, the steeple has not been made more prominent.

About 2 miles to the northward of Calandsoog is a high sand-hill named Dubbelduin (double down), and one mile farther on are two light beacons on the sand-hills, called the Groote kaap and Kleine kaap (great and little beacons), which, when brought in line, answer the same purpose as Calandsoog on with the sand-hills. The Groote kaap, 64 feet above high water, has a round head, and the Kleine kaap, 36 feet high, a square head; they stand 484 yards from each other, bearing S.E. ½ E. Two conspicuous sand-hills a little to the northward of the kaaps are named the Bollen. Kykduin lighthouse stands at the northern extremity of the Sand-dike, a range of sand-hills in continuation of the Bollen, 4 miles from the Groote and Kleine kaaps.

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* Three buoys (1878) have been moored in 6 fathoms, at one mile from the shore, in connection with the dredging operations.

Close to the sand-hill on which Kykduin lighthouse stands, are the two beacons, Schouten kaap and Kleine kaap, with the steeple of Huisduinen and a mill showing between and near them. Beyond these, the coast at the opening of the Texel trends easterly, and is lined with the houses forming the village of the Helder, and the royal dockyard, &c., at the Nieuwe diep. On approadhing the coast near Kykduin with the lighthouse in sight, but before rising the sand-hills, the masts of the shipping at Nieuwe diep, with the churches and crane at Willemsoord, soon appear; on nearer approach the fort on the highest sand-hill, with the low receding land to the northward breaking off at Texel gat, are easily distinguished.

The Polder, a bank 2 miles long and half a mile broad, with 12 feet upon it, lies 2 to 3 cables from the beach abreast the village, and nearly parallel to the coast; from the depth of 3 fathoms upon its south end Petten bears E.S.E. To clear this bank it is necessary to keep in a depth of not less than 10 fathoms. A red nun buoy with a cross, and called Pettenpolder, is moored outside the northern end of the shoal.

THE NORTH SEA CANAL.—The trade of Amsterdam having been greatly on the decline of late years, lead to the construction of the North Sea canal, which was opened on the 1st November 1876, thus joining Amsterdam with the North sea by a more direct and shorter communication than that through the North Holland canal, which, although adapted for vessels drawing 16 or 17 feet water, is nearly 50 miles long, and involves navigating the channels between the shoals at the Texel leading to its entrance at Nieuve Diep, whereas the North Sea canal is only 16 miles long, and has its entrance on the coast between Wyk-aan-zee and Zandvoost, about 35 miles north of Brielle bar, and 31 miles S.W. by S. of the Texel, bringing Amsterdam within 3½ hours passage of the North sea.

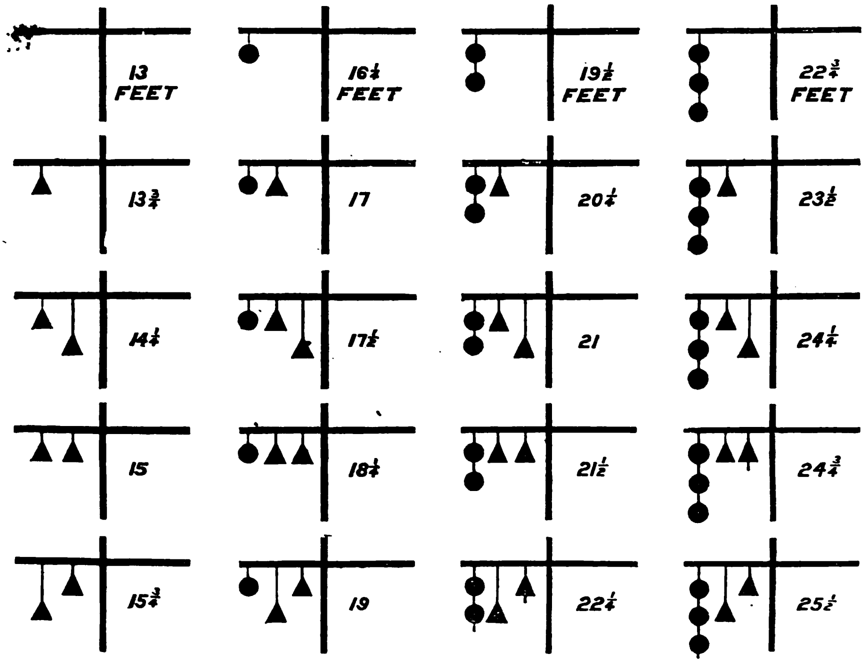
Noordzeehaven, (Ymuiden), the outer haven of the canal is formed by two stone jetties each 1,800 yards long, which extend from the shore at a distance of 1,300 yards apart, and converge so as to leave an entrance 290 yards in width, enclosing a harbour 250 acres in extent, with a proposed average depth of 26 feet water, which has already proved itself a place of considerable use during gales of wind as a harbour of refuge. The canal, when completed, will have a depth of 23 feet water in it, with sea locks, having two basins, the larger one being able to accommodate a vessel 390 feet long, 59 feet wide, and drawing 27 feet water.

In November 1877, there was a depth of 17 feet at low water, in the buoyed channel of Noordzeehaven. The sea sluices must be passed through during the day time.

The canal also connects Amsterdam with the Zuider zee by large locks having three basins. The locks are for the use of the numerous small craft and fishing vessels sailing between Amsterdam and the different towns on the shore of the Zuider zee.*

TIDAL SIGNALS.†—**By day**:—The depth of water at each change of two-thirds of a foot, so that the depth over the shoalest spots in the buoyed channel will be shown (within 8 inches at the most), by balls and cones, visible from seaward, hoisted at the yard arm of the mast on the sand hill, south side of the canal entrance (Ymuiden).

Day signals.†—Balls and cones.



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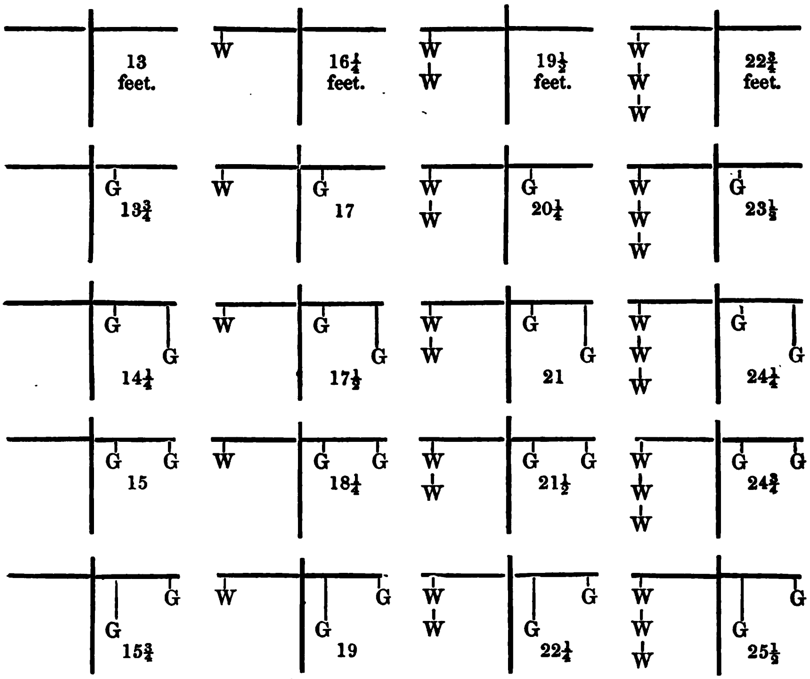
* *See*, Gids voor de Noordzeehaven to Ymuiden (Guide for the North sea harbour at Ymuiden), Amsterdam.

† As in use November 1877.

Night signals.—The depth at low water at the corresponding hour of the day previous, will be indicated by *white* and *green* lights, preceded by a preparatory single light, shown from the same position as the day signals.

White (W) and *Green* (G) lights.



Also the following signals will be shown from a mast to the right of the semaphore (as visible from seaward), viz. :—

During flood tide	-	White flag with diagonal black cross, and black pendant over it.
During ebb tide	-	The same flag, with black pendant under it.
At high water	-	The flag alone.
At low water	-	The pendant alone.*

Buoys.—The channel through the outer harbour is marked by five black buoys on the north side, and by five white buoys on the south side.

On the southern mole head is an iron pillar, useful as a day mark.†

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* The pilots reckon the average time of high water at new and full moon as 3 o'clock, or about half tide. The northern (flood-tide) runs for the haven full two hours longer.

† Fronting Noordzeehaven, parallel to the coast and 1½ miles off it, three buoys are moored in from 6½ to 7 fathoms water, outside of which the sand dredged from the harbour is deposited. The northern buoy is chequered red and white, the other two are red.

CANAL REGULATIONS.—Every Commander of a vessel navigating the canal or using the harbours must be provided with a copy of the "canal regulations," and shall, on demand, produce it to the canal officials.

No ship is allowed to navigate the canal until the tolls have been paid.

All ships are admitted into the canal which do not draw more than 21 feet for the navigation of the outer and inner harbours and of the main channel; 9¾ feet for the branch canals leading to Spaandam, Nanerna, and Zaandan, 11¼ feet eastward of Amsterdam, 9 feet in the canal Nieuwendam; 5 feet in the canal of Beverwijk; 4¼ feet in the other canals, and which vessels have a freeboard of not less than 10 inches.

All ships must keep close to the shore while passing steam dredging machines, which are distinguished by a blue flag during the day and a *blue* light by night, and a vessel on approaching a dredger must give warning.

On nearing a sluice or bridge the speed must be slackened and warning given.

If by day, a red flag with a white circle in the centre, or by night two *red* lights hoisted one above the other are exhibited at the North sea sluices; ships approaching them must not pass beyond a board which is placed at 560 yards from the sluice, but must be securely made fast.

The hauling of ships through the sluices and bridges must be effected only by making use of the timber heads, posts, pillars, moorings and buffers. In passing through, all sails must be lowered, until the ship has quite cleared the sluice.

Such ships as may be obliged to stop anywhere in the canal must be safely moored.

In case a ship takes the ground, and has to be lightened of her cargo, this must be performed without delay by the captain with the means at his command.

The captain of a sunken ship must at once take measures to raise her, and remove the sunken articles, and at the same time to inform the nearest canal official of the accident. The captain is also to immediately place a buoy constantly above water over or close to the sunken ship, with a white flag during the day, and a lantern giving a *bright* light from sunset to sunrise.

No steam vessel is allowed to proceed at a greater speed than 5 knots an hour without permission.

On entering a sluice the speed must be so decreased that the vessel may, if necessary, be stopped by ropes without the help of the engines.

If an anchor or any other article be lost in the canal, the captain, if he is unable to raise it or find it, must at once give notice to the nearest canal official.

Ships inward bound and navigating or lying in the outer harbour, shall receive the orders of the harbour master by means of signals in accordance with the general signal book of all nations, hoisted at the mouth of the inner harbour. Ships coming in at night must anchor in the outer harbour.

In case of fire breaking out on board of any ship in one of the harbours, the captain shall immediately give notice of it to the harbour master, and at the same time have the bell rung.

The captains who wish to have their ships moved from the inner harbour shall previously give notice to the harbour master, who will determine which ship shall be the first to leave the harbour.

LIGHTS.—On the coast between the Hook of Holland and the Texel the following lights have been established.

Scheveningen lighthouse is an iron tower and painted dark brown, which exhibits, at an elevation of 157 feet above high water, a *revolving red* and white light, showing a flash alternately red and white *every half minute,* visible at a distance of 18 miles in clear weather.

At Katwyk a *fixed* white light, on the sand-hills, 82 feet above high water, is shown when fishing boats are out; it is visible for 8 miles, between the bearings from seaward of N.N.E. and W.S.W.

At Noordwyk a *fixed* white light, 66 feet above high water, and visible 5 miles off, is shown from a stone tower on the sand-hills to the north-east of the village when the fishing boats are at sea; also visible in the same direction as the last.

At Zandvoort a *fixed* white light for the use of the fishermen, 75 feet above high water, and visible 6 miles off, is shown from a stone tower on a sand-hill northward of the village.

Egmond-aan-zee light-towers stand on the sand-hills close to the westward of the village, with its bluff square tower, at nearly 34 miles from Scheveningen, and 8 miles from Wyk-aan-zee; but on lower ground than the highest sand-hill and seaward of it, the northern lighthouse is distinguished by a frame work on its north and south sides. They bear N.N.W. ¾ W. and S.S.E. ¾ E., 408 yards apart, and each exhibits, at the respective heights of 120 and 126 feet above high water, a *fixed* white light, visible respectively 16 and 18 miles in clear weather from the direction S.S.W., round west, to N. by E.

Noordzeehaven lights are *fixed* white lights and bear from each other N.W. by W. and S. E. by E. The lights in line lead into the outer harbour. These lights (of the first order) will be shown from towers, so placed, that when in line they will lead in mid-channel through the outer harbour.

In addition to the above leading lights there are four other lights, of which, the two *red* lights in line indicate the north side, and the two *blue* lights in line the south side, of the harbour entrance; these lights in line lead respectively about 16 feet clear of the outer moles. The outermost two of these smaller leading lights are exhibited from the mole heads; the inner two, at the entrance of the inner harbour of the canal.

At Zandijk, at the southern entrance of Schulpe gat are two wooden light-beacons, 484 yards apart, in a N.W. ½ W. and S.E. ½ E. direction. Both lights are *fixed*, the eastern one is 64 feet above the sea, and visible 10 miles, and the western one 36 feet above the sea, and visible for 6 miles. The outer buoy of the gat is in line with the two lights, which can be seen between the bearings of E.S.E. and S.E. by S.

☞**Falga** light, 1½ miles S.S.W. of Kykduin, is *red* and *green* and shown from a wooden building; it is visible 4 miles.

Dirkoomsduin, on the sand-hills, 613 yards south-west of Kykduin, is a *fixed* light which, from an iron tower elevated 61 feet, can be seen 12 miles south-west of the bearings of E.N.E. and N.N.E. In one with the Kykduin light, it leads to the outer buoy of the Sculpe gat.

Kykduin lighthouse is a sixteen sided iron building, 182 feet high, painted brown, standing about N.E. ¼ E. one third of a mile from the battery on the highest part of the downs. It exhibits at 187 feet above high water, a *fixed* white light, visible 20 miles off in clear weather.*

Nieuwe diep, on the western pier-head of the Nieuwe diep are two harbour lights, S.W. and N.E., 51 yards from each other. Both lights are *fixed*, the higher is *red*, and the lower (Wierhoofd) white, they are respectively 35 and 29 feet above high water, and are visible 8 miles.

Schilbols nol and Stuifdijk leading lights for the inner bar of Sculpe gat are on the south side of Texel island. The lights are *fixed* and exhibited respectively at 28 and 21 feet above the sea, and can be seen in clear weather at a distance of 8 miles. They bear N.E. ¼ E. and S.W. ¼ W. from each other, and are 867 yards apart.

Life boats.—Another benevolent society, with an object similar to that on the coast of South Holland and Zeeland, already referred to, in page 131, has been established at Amsterdam under the name of the North and South Holland Society. It has life-boats stationed at the following places along this coast: Monster, Ter Heyde, Scheveningen, Katwyk, Noordwyk, Zandvoort, Wyk, Egmond, Petten, Calandsoog, Huisduinen, Texel, Nieuwe diep, Vlieland, Terschelling, Ameland, and Schiermonnikoog. This society has been instrumental in saving the lives of a great number of persons in cases of shipwreck.

TIDES.—From the Maas northward, to a position 8 or 10 miles from Kykduin lighthouse, outside the influence of the channels through the Haaks, the flood stream, or northern tide, during the first five hours of its continuance, sets N.E., and for a part of the sixth or last hour E.N.E.

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* The lighthouse is situated N. 47½ E. about 650 yards from the old light tower, (to be r[illegible]d in the same line of direction with regard to Dirkoomsduin leading light.

When near about high water, it trends to the East and E.S.E., and after continuing for a while in the latter direction, it goes round to S.E., until high water. The ebb stream sets S. by W. the first hour, veers round during the next four hours to S.W., and so to West and to the northward during the last hour, attaining a N.E. direction by the time the flood makes. Along the whole of this coast the tide streams set 6 hours each way, but it is only during the first three hours of the flood stream that any rise is perceptible on the shore, the falling of the water lasting during nine hours. On full and change days, the flood begins at noon, and by 3 o'clock the tide has attained its maximum height between Scheveningen and Petten.

CAUTION.—Buoys marked with the word Telegraph are laid down in the line of direction of the submarine cable between Dunwich, near Southwold, on the coast of Suffolk, and Zandvoort near Amsterdam on the coast of Holland; vessels are cautioned not to anchor within a quarter of a mile north or south of the line of these buoys, which extend from the coast-guard buildings at Minsmere, near Dunwich, in an E.S.E. direction, lest by so doing they lose their anchors or damage the electric cable.

DIRECTIONS.—Scarcely any special directions are necessary for navigating the coast from the Hook of Holland as far as Calandsoog. The shore is clean, and it has a general northerly direction; it may be approached with confidence by the aid of an observed latitude and ascertained depths; but even in the absence of an observation, the land may be approached with comparative safety to obtain a departure, especially about Egmond, where the objects are of a well-marked character. In fine weather, and with the wind off shore, the whole coast may be skirted in a depth of 6 or 7 fathoms, except abreast Petten, where the Polder bank (page 159) will be cleared by not going within the depth of 10 fathoms. In winter, however, it will be prudent not to make too free with the land, for, owing to the direction of the coast and the frequency of westerly storms, a vessel might be placed on a lee shore, from whence it would be nearly impossible to escape, without she possessed sea and weatherly qualities to obtain an offing.

BROWN RIDGE.—About 3 miles northward of the parallel of Zandvoort, and on the meridian of 3° 20′ E., is the south end of a narrow ridge, which extends to the northward for upwards of 20 miles; about 10 miles to the eastward is another ridge, and between them a third, with general depths over them from 11 to 15 fathoms, and with deep water between them. The soundings will be a guide to vessels when in this vicinity.

The TEXEL or Texel gat, upwards of 2 miles wide, is the important passage between the Helder and Texel island, and connects the North sea with the Zuider zee, the Nieuwe diep, and the Great North Holland canal leading to Amsterdam. The land bordering the gat, which embraces from Calandsoog to the Helder, has been described. *See* pages 158, 159.

TEXEL ISLAND.—The south-west and north-west sides of Texel island are defended by sand-hills like the coast to the southward. In the south-west part of the island are the villages of Hoorn and Westen; the church tower of the latter, square and bluff, can be seen from sea only occasionally and in clear weather; that of Hoorn has a spire, and stands farther southward. Upon the south-west shore are two sand-downs, rendered remarkable by the deep score between them, one is named the Heuvel, and the southern and larger Ionge Pietersdune; and these, with the aforenamed steeples, form important leading marks in the navigation of the channels of the Texel. About 1½ miles N.W. by W. ¼ W. from Westen is a beacon on the sand-hills near the shore; and 3½ miles northward of it is another near a house called De Koog. Off the south-west end of Texel island the foreshore dries out about a mile, but on the opposite side of the gat the water is deep close to. *See* page 177.

PILOTS.—The Texel pilot vessels, cutter-built and rigged, cruise in the English channel near the Isle of Wight. The coast pilot boats are always cruising near the entrance of the Schulpe gat, unless driven in by south-westerly gales, when the strong flood tide stream which then exists renders it next to impossible for a vessel to maintain her position. These boats termed Rinkelaars, have a round stern, mizen-mast, and bowsprit; the word *Texel* is painted in large letters on their mainsail, and they carry a blue flag with a white number on it.

There are steam-tugs at Nieuwe diep, which may be obtained by vessels in the offing showing two flags,—one at the masthead, the other 4 or 5 feet below it. This signal may be made as soon as Kykduin lighthouse is well in sight, from whence it will be repeated by a ball. The lowering of the ball is a signal that the steamer is on her way out; but should a red flag be hoisted, it denotes that the desired assistance cannot be rendered.

HELDER and NIEUWE DIEP.—The Helder is a strongly fortified military post, commanding the channel into the Zuider zee, as well as the Nieuwe diep. From being little more than a fishing village, Napoleon converted it into a fortress of the first rank, capable of containing 10,000 men in bomb-proof casemates, and it has been considerably strengthened since then. Population 2,846, or including Willemsoord, with which it is closely connected, 10,000.

The Nieuwe diep, the outlet of the Great North Holland canal, originally a narrow swatchway between the Zuid wal and the shore, has been made to serve the purposes of a harbour. It is rather more than a mile in length, running in first S.W. by W., and then S. ½ E. and S. by E. ½ E. and its depth admits of vessels passing through at all times. It was not unusual before the introduction of steamers, to witness upwards of 100 sail waiting here during westerly gales. The royal dockyard is on the west side of the Nieuwe diep.

Time-ball.—A time-ball is exhibited at the main-top gallant yard of the guard-ship lying in the Nieuwe diep, for the rating of chronometers. The ball is hoisted half up at 5 minutes, and close up at 2 minutes before 12 o'clock, and is dropped at the instant of noon, Nieuwe diep mean time; the moment of noon being that in which the ball leaves the top-gallant yard. The longitude of the Nieuwe Diep is 4° 46′ 41″ East of Greenwich.

GREAT NORTH HOLLAND CANAL.—This noble work, which has its outlet at the Nieuwe diep, was constructed between the years 1819 and 1825, and enables large ships to pass up to Amsterdam, and thus to avoid the shallow and intricate navigation of the Zuider zee. This canal will be to a great extent superseded by the North Sea canal, *see* page 159. The length of the canal is 46½ miles; the width at the surface of the water from 118 to 197 feet, sufficient to allow of two large vessels passing each other; the width at the bottom 36 feet; and the depth is from 16 feet 5 inches to 17 feet 8 inches, which latter depth it is intended shall be obtained throughout. The locks at either extremity, and also two sluices with flood-gates in the intervening space, are double, that is, there are two in the breadth of the canal. The canal is crossed by eleven bridges. There are canal pilots, and no vessel drawing more than 11½ feet is allowed to pass through the canal without having one on board; these men are provided with copies of the canal regulations, printed in French, English, and German. The towage is at present performed by horses, but it is intended to introduce screw steam tugs for this service. The time occupied in passing through the canal varies between 2 and 4 days, according to the force and direction of the wind.

AMSTERDAM.—The most important commercial city of Holland, is at the confluence of the Amstel and the Y, an arm of the Zuider zee; it is the largest town in Holland, and constitutionally its capital. The sea front of the city forms a nearly direct line of 1½ miles in length along the Y, flanked at either end by docks, and intersected near the centre by the Dam rak, the principal outlet of the Amstel. The city is cut up into 90 islands by the canals, in which vessels are to be seen passing to and fro or loading or unloading in all parts of the city. Railways connect it with all the first cities and towns of Holland, and the continent. By the Amstel, the Zuider zee, and various canals, Amsterdam has water communication with all parts of Holland. Population in 1874, about 281,900.

The manufactures of Amsterdam are principally of linen, woollen cloths, cottons, silk fabrics, geneva, &c., and diamond cuttting employs about 1,000 hands; but though these are considerable, it ranks much higher as a trading than as a manufacturing town. The total value of its exports in 1840 was 6,225,083*l*., and of its imports 7,944,958*l*.; the principal exports consisting of butter, cheese, refined and raw sugar, coffee, spices, oils, dyes, colours, corn, and meal; and the principal imports, coal, sugar, coffee, hemp, grain, linseed, tea, spices, cotton wool, hides, tobacco, &c. In 1872, there arrived at Amsterdam including coasters 1,329 sailing vessels of 471,270 tons; while there cleared 1,416 vessels of 473,432 tons. The number of steam vessels entered were 374 of 151,204 tons, and 372 left of 149,667 tons. The trade carried on by the steam vessels being between England, France, Germany, Russia, Portugal and the United States. In 1874 the imports to the Netherlands from Great Britain amounted to 21,289,635*l*., and exports to the same to 14,464,158*l*.

Amsterdam has a wet dock which will float vessels drawing 14¾ feet water, and more wharfage accommodation outside the docks is about to be made. There are several yards where vessels of from 2,000 to 3,000 tons register are built; and three floating docks in which vessels can be repaired.

The HAAKS BANKS.—The approach to the Texel from the North sea is beset with no common difficulties, it being obstructed in every direction by sand-banks, which, comprised under the general application of the Haaks, form a barrier crossing from the south-west to the north-east, fully 12 miles in extent. These sands have but from 6 to 3 feet water over a great portion of them and in some places are dry at low-water. They are divided by several navigable channels. Upon their west or seaward side, the Haaks fall almost perpendicularly into a depth of 10 and 11 fathoms, their surface is subject to frequent alteration, and these features are rendered the more dangerous on account of the distance to which the sands lie out from a coast of low elevation, and great uniformity of appearance.

The following is a brief description, avoiding minor and confusing details, of the two divisions of the Haaks:—

SOUTH HAAKS occupy a triangular space, extending from near the Bollen, where one side is presented to the south-westward, and the apex is close in shore abreast Kykduin. Each side of the sand may be considered as about 4 miles in extent: its highest, or shoalest portions are the Wittetons rug (Whitebuoy ridge), a ridge of 6 feet upon the outer part of the sand; and the Bollen, a large and irregular bank, with 12 to 3 feet upon it, on the south-east or in-shore side of the sand. These two portions are separated by an irregular and unnavigable swatchway named Lands diep. An extension, or bar, named the Rug, connects the north-east extremity of the South Haaks with the shore within Kykduin. The principal channels into the Texel—namely, the Schulpe gat, the Old West or Z. W. gat, and the West gat, on the south-east, the west, and north sides of the South Haaks—are marked out by the following buoys, which, however, are liable to be changed as the alterations in the channels require.

Buoys.—The south-east side of the sand, forming the north-west side of the Schulpe gat, is marked by black buoys, thus:—Outer, No. 1 buoy, a black nun, lies in 4½ fathoms at the south-west angle of the South Haaks with the Groote and Klein kaaps in line S.E. ½ E., 1½ miles, and Kykduin and Dirkoomsduin lighthouses, in line N.E. ¼ E.; No. 1 to No. 2 buoy, N.E. by N. ½ N., two thirds of a mile; No. 2 to No. 3 buoy, N.E. by N. ½ N., three-quarters of a mile; No. 3 to No. 4 buoy, N.E. ¾ E., two-thirds of a mile; No. 4 to No. 5, N.E., two-thirds of a mile; No 5 to N. 6 beacon buoy, N.E. ¾ N. three-quarters of a mile; No. 6 to 7 buoy, N.E. ¾ E., half a mile; and No. 7 to No. 8 (Zwemmer) buoy, N.E., a third of a mile. The distances between these buoys and the shore gradually diminish from a mile at No. 4 buoy to a third of a mile at No. 8. No. 7 and No. 8 are upon the Rug. To mark the target practice from fort Kykduin, two black and white chequered buoys are placed between the black buoys Nos. 7 and 8, and 320 feet apart, with Kykduin lighthouse bearing about S.E.

A large red and white horizontally striped nun buoy called *South Haaks*, with a red half ball, lies in 10 fathoms water with the Groote and Kleine beacons nearly in line S.E. ½ E. above 5 miles; Hoorn spire in the score, N.E. by E. ½ E.; and the Schulpe outer buoy, S.E. ½ E., 3½ miles. The Middle Haaks buoy is red with two balls and lies outside the West gat bar with South Haaks buoy bearing S. by W. 2 miles, and Falga lighthouse S.W. by W. ½ W. The north side of the South Haaks is marked by four white buoys.

NORTH HAAKS are rather more extensive than the South Haaks, but, like the latter, are triangular in shape, with a ridgy shallow extension from their northern extremity, named the Ezels bank, fronting the west part of Texel island, and extending past it for some distance to the north-eastward. The surface of the North Haaks is exceedingly irregular and shallow, and it is divided by several swatchways, the Vlakte Haaks, the Molen gat, the Vlakte and Kolk, and Duinkers gat. The highest portions are the Onrust, on the north-east side, which dries 6 feet at low water over a considerable space; the Middel rug, upon the south-west side, which has, for the most part, 10 and 12 feet over it, and dries at its eastern end; and the Laan, a long and narrow ridge of 3 and 6 feet, at the south-east extremity of the North Haaks.

Beacon.—A wooden refuge beacon stands on the southern or outer edge of the dry part of the Onrust, with Hoorn church bearing N.E. ½ E., Nieuwe diep crane S.E. southerly, and Kykduin lighthouse S. ¾ E. The floor of the chamber is about 13 feet above high water and the top 21 feet.

Buoys.—The Middel rug and the Laan, forming the north side of West gat, are marked by nine black buoys, which it would be only misdirecting to give bearings for, on account of the changes constantly occurring in the sands.

The North Haaks, a large buoy, vertically striped black and white, and surmounted with a black ball; from it Hoorne spire in line with Loodsmans duin bears E. ⅓ N.

FRANSCHE BANK (French bank) and the flats from the shore form the south-east side of the Schulpe gat. The Fransche is a detached 20-feet ridge, narrow, but nearly a mile long, and connected with the south-west extremity of the South Haaks by a ridge of 24 feet, which may be considered as the outer bar of the Schulpe gat.

Buoys.—The south-east side of this passage is marked by two white buoys, lying on the outer edge of the Fransche bank, two-thirds of a mile apart, the southern one bearing E. by N. ¾ N. three-quarters of a mile from the outer black buoy of the Schulpe gat, and S.E. ¼ E. from No. 2 distant half a mile.

Four white buoys lie upon the edge of the flat from the shore, in the vicinity of Kykduin, and mark the south-east side of the passage over the Rug, or the inner bar of Schulpe gat. This part of the channel is called the Drempel (or threshold). The first southern buoy bears N. by W. ¾ W. above half a mile from Falga lighthouse, and S.E. by E. ¾ E. half a mile from No. 5 black buoy; the second white buoy off Dirkoomsduin bears N.E. by N., nearly one mile from the first buoy; the third buoy is off Kykduin; and the fourth buoy is near the land to the westward of Kaaphoofd.

SCHULPE GAT (or Shell gat) is the best of all the Texel channels. It extends N.E. by N. for 4 miles close along shore, and is direct, and simple of use. Between the south part of the South Haaks and the Fransche bank the width is about half a mile, and the depth upon the outer bar is 21 feet; within, the breadth decreases gradually from two-thirds to a third of a mile, and the depth varies from 4½ to 12 fathoms, and to 6 fathoms near the bar of the Drempel, where, upon one patch in mid-channel between the buoys, the depth is 18 feet.

From the Drempel the shore of Helder to the Nieuwe diep is steep-to. The course, after the Drempel has been cleared, continues round the Kaaphoofd into the Helsdeur, or channel between the Helder dike and Laan, which is three-quarters of a mile wide, with 12 to 20 fathoms in it, and an extension of it, under the name of Mars diep, continues along the shore of Texel island, while to the south-eastward it proceeds along the shore of the Helder towards the Balg, this latter channel being divided from the former by the western extremity of the Lutje waard flat, named the Bollen, which is marked by a red buoy lying in 20 feet water.

HELDER ROAD, or Texel road, is to the north-eastward of the Nieuwe diep, between the Bollen and Zuid waal, or northern edge of Balg zand. The anchorage marks are Burg steeple in line with Horntje, a sand-hill at the south part of Texel island, N.N.E., and Kykduin lighthouse W. ¾ S.; the depth 12 fathoms. The ground, a soft clay, is indifferent for holding; West and W.N.W. winds send a heavy swell in, and the anchorage should only be used for a temporary purpose by vessels bound up the Zuider zee. If bound to the Nieuwe diep, the best plan is to enter it at once, if a pilot is on board.

Mars diep.—From No. 9 black buoy, the edge of the Laan and the flat of the Texel, extending steeply and continuously in an E. ½ N. direction nearly towards the south part of the island, form the north boundary of the diep.

WEST GAT.—This channel has become less serviceable owing to the continual shifting northward of the sands and shoaling of the water; within its entrance it runs nearly East between the North and South Haaks, and its width varies from near three-quarters of a mile between the Middel rug and Wittetons rug, to upwards of a mile at its inner part, named the Breewijd or Broadway, between the Bollen and the Laan. An irregular double ridge, with 16 feet upon it, obstructs the entrance of the gat; but within, the depth increases to 8 and 14 fathoms.

Strong breezes raise a turbulent cross sea in this channel, which is marked, as already described, by nine black buoys on the Middel rug and Laan to the northward, and by five white buoys and a horizontally striped red and white buoy at the point where the Old West gat branches off from the West gat to the southward; both the second white and third black buoys are within the bar.

OLD WEST or Z.W. GAT.—In consequence of the water on the bar having shoaled and other changes in the West gat, the Old West gat on the south side of West gat and to the westward of Wittetons rug, has been buoyed with two horizontally striped red and white buoys on the west side and two white buoys on the east side. The course through is E.N.E., and the depth of water 15 feet at low water.

OLD CHANNELS.—The Noorder gat, leading along the south-west side of Texel island into Mars diep, and the Molen and Duinkers gats between the Middel rug and North Haaks, though at one time used by large vessels, have become partially or entirely closed, and are now unbuoyed. The Lands diep across the South Haaks, between Wittetons rug and Bollen, should never be attempted without a pilot; a small vessel will, however, carry over the shoal about 14 feet with Hoorn spire east of Jonge Pietersduin bearing N.E. ½ E.

TIDES.*—It is high water, full and change, outside the shoals at the entrance of the Texel at 6h. 30m.; off the Noorder gat at 6h. 45m.; at the Nieuwe diep at 7h. 27m.; and in Texel road at 7h. 25m. In the channels spring tides rise 4 feet; neap tides rise 3½ feet. Westerly gales usually cause an increase of about 8 inches.

Near the mouth of the channels, the latter part of the ebb stream trends to the north-west, and at the same period of the flood the stream runs S.E.; this last portion of the flood, which is called the land tide, causes the water in the channels, the height of which had for a while been stationary, to rise 4 inches more.

In the Schulpe gat, the stream sets generally in the direction of the channel; but from the entrance to as far as the fourth black buoy, both flood and ebb rather incline towards the side of the Haaks, and at the inner part of the channel somewhat towards the white buoys. At the Drempel the water is never still, the flood and ebb succeeding each other without intermission. At the entrance of the gat and at the Nieuwe diep both tides run six hours, except during strong winds. During the prevalence of gales from N.W. or S.W., it is estimated that the flood runs 8 hours, and the ebb for 4 hours. At such times the ebb stream is weak, while that of flood acquires an increased velocity. When the ebb stream is increased by a fresh, its course along the sea-wall of Helder is extremely rapid.

In the Helsdeur the rise and fall each hour is as follows:—

	Rise.			Fall.	
	ft.	in.		ft.	in.
During the 1st hour of flood	1	2	During the 1st hour of ebb	0	8
„ 2nd „	1	9	„ 2nd „	0	10
„ 3rd „	0	5	„ 3rd „	0	10
„ 4th „	0	2	„ 4th „	0	8
„ 5th „	0	2	„ 5th „	0	6
„ 6th „	0	4	„ 6th „	0	6

DIRECTIONS for the TEXEL.—The Schulpe gat lies N.E. ½ N., 68 miles from the Hook of Holland; E. by N. ¼ N. 150 miles from the North Foreland; E. ½ N. 125 miles from Orfordness; E. ½ S. 110 miles from Lowestoftness; and S.E. 190 miles from Flamborough head.

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* *See* Admiralty Tide Tables, Section III.:—Tidal streams in the North sea.

The steep and dangerous character of the Haaks has already been adverted to. It may also be added, that though landmarks abound, and the land between Calandsoog and Kykduin, termed the Sand-dike, will be visible in clear weather at the distance of 14 or 16 miles, yet with the least haze no more is to be seen here than on other portions of the Dutch coast under similar circumstances; namely, an indistinct waving line. At such times it is necessary to be extremely cautious, particularly as the stream of flood sets to the north-east, and the lead gives no warning of the vessel's approach to the west side of the banks.

From the above remarks it will be seen that it is advisable for strangers not to attempt any of the channels leading to the Texel without the aid of a pilot.

From the SOUTHWARD.—Ships from the English channel, bound to the Texel, should not make the land farther north than Egmond or Kamperdown, as there are situated the best distinguishing marks on the coast. Caution is necessary not to mistake Kamperdown for Kykduin, *see* page 158, because between Kamperdown and Petten, or the downs of Calandsoog, the land is so low that it appears like the entrance to a spacious harbour. It is advisable during the winter season not to go into less than 13 fathoms water, which is a safe depth for rounding the Haaks, either to the northward or southward; and it is also to be noticed, that to the westward of the Haaks the streams of flood and ebb run nearly parallel to the western edge of the sands, that is, N.N.E. and S.S.W.

On ordinary occasions, having sighted the village of Calandsoog, and not having gone into a less depth than 10 fathoms, in order to avoid the Polder of Petten, the great and little beacons will be seen about 3 miles to the northwards, and afterwards the lighthouse of Kykduin. Should the day be too far advanced for the vessel to proceed in, then stand off and on during the night, with Kykduin light between East and E.N.E., in not less than 12 fathoms, and bear in mind while in this position, that the stream of flood sets N.E., or right towards the South Haaks, and the ship's head should then be laid so as to stem the stream.

In the fine weather of summer, vessels, instead of lying-to in the offing, may anchor outside the Schulpe gat with Kykduin lighthouse N.E. by E., and Calandsoog steeple S.E., in 8 fathoms, about 3 miles off shore. In winter, when of course no vessel should anchor, a blue flag hoisted at Kykduin is a signal that the channels are encumbered with ice.

From the NORTH-EASTWARD.—The approach to the channels of the Texel is difficult from the north-east, and great caution is necessary, the course lying along a chain of low islands, having few objects to distinguish them, where the irregularity of the tides baffles ordinary calculation, and where the approach to the land is rendered additionally hazardous by extensive sand-banks, and the prevalence of westerly gales and hazy weather. It becomes necessary in closing the land under such circumstances, and not having sighted the lights of Ter Schelling and Vlieland, to be very guarded against errors of longitude, for a mistake of a few miles might prove fatal, vessels seldom escaping immediate destruction when driven ashore in this vicinity in hazy weather.

By Night.—Rounding Texel island from the north-eastward during the night, be cautious not to shoalen the water under 13 fathoms, so as to avoid the Eyerlaad grounds, and the Ezels at the North Haaks, as the stream of flood sets directly towards them, and they are consequently specially dangerous in thick weather. If the lights of Ter Schelling and Vlieland have not been sighted, then the soundings will be the only guide; and be careful to keep in at least 13 fathoms while rounding, until to the southward of the Texel, or till Kykduin light bears to the northward of East, for, as before observed, 10 and 11 fathoms are close to the edge of the sands, and south-westerly gales have the effect of raising the water considerably, and thus deceiving as to distance.

Through the SCHULPE GAT.—In approaching the Schulpe gat from the offing, Calandsoog steeple just clear of the sand-hill S. by E. ¾ E., and the great and little beacons of Zanddijk in line S.E. ½ E. lead to the westward and south-westward of the South Haaks. Kykduin lighthouse N.E. ¼ E. leads just within the outer black buoy, which has the great and little beacons abreast in line.

In north-westerly winds, and with smooth water, the Schulpe gat may be entered across the south-west tail of the Bollen to as far as the third black buoy, in not less than 19 feet at low water.

Having entered from either direction, all the black buoys are to be left on the port hand, and the leading mark through the gat from within the outer buoy is the steeple of Westen, in Texel island, appearing in the score between the Heuvel and Jonge Pieters-duin, N.E. ¾ N. This steeple will be known by its being stunted, while that of Hoorn, a little to the eastward, has a spire. The above mark will lead to abreast the sixth black buoy.

Leaving the mark, the course will then be N.E. by E., between the black and white buoys marking Drempel channel, in which there are 20 feet at low water, excepting on one patch on the bar in mid-channel between the buoys, where the depth is only 18 feet, and here, in light winds, special attention must be paid to the steerage, for the channel is narrow, and the tide is rapid and cross.

In turning to windward, the Bollen, except at its inner part, may be ap [illegible] ll Westen steeple appears over the Heuvel, and in standing towards the Fransche bank, keep the steeple of Burg, in Texel island, open of the shore at Kykduin; and farther in upon the same side do not go into less than 6 fathoms.

From abreast Kaaphoofd to Helder road, the course is E. by S. southerly; the Helder dike is bold, and may be neared to a cable's length and in passing the Nieuwe diep keep at the same distance from the pier-heads, so as to avoid a sandy spit westward of the West pier.

By night.—The leading mark for the entrance of the Schulpe gat is Dirkoomsduin and Kykduin lights in line bearing N.E. ¼ E. until Falga light bears E. by S. and changes from green to red, then steer N.N.E. for nearly a mile until Schilbols nol and Stuifdijk lights on the south side of Texel island are in line bearing N.E. ¼ E., then keep them so to pass mid-way over the inner bar, and when Wierhoofd (Niewe diep lower) light is seen, keep towards Texel roadstead; or, Schilbols nol and Stuifdijk lights in line will lead through the whole length of the gat.

CAUTION.—Should the Drempel be passed through at the beginning of the flood, the ebb stream will be found sweeping with full force past the Helder dike towards the West gat, and if the wind be too light to enable the vessel to make head against the stream, anchor at once to prevent being driven down the Breewijd.

Through the WEST GAT.—Coming in from the westward, bring Kykduin lighthouse to bear S.E. by E. and steer for it on that bearing, till midway between No. 1 black buoy and No. 1 white buoy, a South course for about a mile will then lead up to a position midway between No. 2 white and No. 3 black buoy, when the course will have to be altered more to the eastward for about 2 miles until between No. 5 black beacon buoy and No. 5 white buoy, then an East course will lead through the Broadway (Breewijd) and Helsdeur to the roadstead abreast Nieuwe diep, taking especial care, as the tide stream is generally setting obliquely across the channel, to keep on the side of the white buoys during the flood, and on that of the black buoys during the ebb. This passage is used more by vessels leaving the Texel than by those entering, and should be sailed only with a commanding leading wind, on account of the oblique set of the tide streams in it.

Through the OLD WEST or Z.W. GAT.—In sailing towards the Old West gat from the offing, keep the great and little beacons for the Schulpe gat in line S.E. ½ E., until Hoorn spire, in Texel island, appears nearly in the score between Jonge Pietersduin and the Heuvel, but rather towards the latter, bearing N.E. by E. ½ E., which will lead to within from a half to three quarters of a mile from the South Haaks buoy, whence steer about E.N.E. so as to pass between the striped red and white buoys on the port side, and the white buoys on the starboard, and across the bar in 15 feet water into the West gat.

The ZUIDER ZEE.—The passage to Amsterdam through the Texel stroom and Zuider zee is only to be undertaken with the aid of a pilot and in small vessels, for the Zuider zee is full of shallows, and though the road in front of the city of Amsterdam has 7 fathoms water in it, the bar of the Pambres, 7 miles below, has only 7 feet over it; and hence, vessels of moderate burden are obliged to discharge a part of their cargoes into lighters, to enable them to reach Amsterdam.

The TEXEL STROOM about 9 miles in length and one in breadth is a continuation of Mars diep and Helder road; it is deep and navigable for the largest ships and the principal channel leading from the Texel to the Zuider zee and Amsterdam. Its direction is first along the south-east side of Texel island as far as Oude Schild lighthouse, it then bends gradually between the sands to the East and E.S.E. for about 7 miles, when it suddenly turns to the southward and becomes so intricate that its navigation is impracticable without a pilot. From Oude Schild the channel is marked by black buoys on the north side and white buoys on the south.

LIGHTS.—At Oude Schild, on the south-east side of Texel island, three lights are exhibited—1. A *fixed red* light on the west mole; 2, a *fixed white* light on the east mole; 3, a *fixed white* light at a dyke, north side of harbour, 219 yards N.W. ¾ W. from east mole light. This light serves a guide for entering the harbour.

Wieringen lights near the west end of Wieringen island are two *fixed* lights exhibited from wooden lighthouse North and South from each other, and 448 yards apart. The lights are respectively 39 feet and 16 feet above the sea, and visible 10 and 4 miles. These two lights point out the track for vessels going from the Zuider zee into the Sloot (the quarantine station for Amsterdam), or from the Texel by Amstel diep towards Amsterdam.

Urk lighthouse on the south-west part of Urk island is a square white tower; the light is *revolving* and exhibited at 82 feet above the sea, is visible for 15 miles, and shows a *flash* of about *ten seconds* duration, followed by an interval of darkness of *fifty seconds.* Between the bearings of S.S.W. and West, the light must not be approached within 2½ and 3 miles. It is a pilot station.

Marken is a *fixed* white light exhibited at an elevation of 52 feet above the sea from a stone tower on the east point of Marken island. The light is visible round the horizon for a distance of 10 miles.

Hoek lighthouse, a stone tower on the north Hoek or point of entrance of Y leading to Amsterdam 4 miles distant W.N.W.; a *fixed* white light is shown at 58 feet above the sea, which can be seen for a distance of 10 miles.

CHAPTER VII.

TEXEL TO THE ELBE, INCLUDING THE ISLAND OF HELGOLAND.

VARIATION 16° 36′ to 14° 36′ West in 1878.
Decreasing about 9½′ annually.

TEXEL ISLAND, the south-westernmost of the group of islands off West Friesland, has a general direction N.E. ½ E. and S.W. ½ W., it is about 11½ miles long, and 5 miles across at the broadest part; its configuration landward is irregular, and its north-eastern part is composed of the former island of Eijerland or Eggland, which was so named from the number of sea-birds' eggs found upon it; considerable numbers of sheep, cattle, and horses are reared upon Texel island. Its population, numbering 4,924, is distributed among six villages, and Burg the market town.

The objects upon the south-west end of Texel island, and its separation from North Holland by the Mars diep, have been noticed in the previous chapter. It is also divided from the Horst of Vlieland by a narrow and intricate passage named Eijerland gat, which is unbuoyed, and only used by small coasters of light draught.*

CAUTION.—The islands Texel, Vlieland, and Ter Schelling, together form a salient point to vessels proceeding coastwise from the south-westward or north-eastward, and no vessel rounding them should approach nearer than 13 fathoms water, especially at night. A want of caution is often displayed in this respect, and much loss has resulted therefrom.

LIGHT.—At the north-east extreme of Texel island is a red stone tower 98 feet high, from which is shown, at an elevation of 154 feet, a light *revolving every minute*, which can be seen 18 miles.

Life Boats.—There is one station with rocket apparatus at De Weston, about the centre of the west side of the island, a second station at the north end, and a third station near Coksdorp on the N.E. side of the island.

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* *See* Admiralty chart:—North sea, Sheet *a*, No. 2,182; scale, $m = 0 \cdot 1$ of an inch; and Zuider zee, No. 2,322; scale, $m = 0 \cdot 5$ of an inch.

VLIELAND ISLAND is about 9 miles long in an E.N.E. and W.S.W. direction, and 1½ miles broad, and its eastern end is 4 miles from Ter Schelling. The island is generally low and sandy, except at its eastern end, where is a village, a windmill, and several beacons. Population about 690.

De Horst.—Extending 3 to 4 miles off the west end of Vlieland is a low sandy waste named De Horst, for the most part only 4 and 5 feet above high water; and as this portion of the island is not visible a few miles in the offing, a fictitious breadth is thereby given to the opening between Vlieland and the north part of Texel island, which has often been the cause of loss from the seaman having mistaken it for the Schulpe gat, the southern entrance into the Texel. To remedy this, a large structure, named Robben-bol beacon, has been erected on the western extremity of De Horst; it has a large oval head supported upon numerous uprights and stays.

Life-boats.—There are two life-boat stations on Vlieland, the one on the N.E. end of the island having also a rocket apparatus.

Telegraph.—A telegraph station, connected with Harlingen by a cable, is established on Vlieland island for the use of vessels entering or leaving the Zuider zee. The message cannot be communicated direct to the station, but has to be sent to the "outlying boat," where the pilots are changed at the Vlierhede, at half a mile from Vlieland, whence the message is signalled by flags to the station. During the night no messages are despatched.

TER SCHELLING ISLAND, including the Bosch, which is only 2 miles from Ameland island, is 13 miles long, 2½ miles broad, and extends in a nearly east and west direction. It is rather higher than the islands hitherto noticed, and many of its duins are composed of bare white sand. There are several beacons on its sand-hills near Brandaris tower for leading into the Vlie stroom; there are also two, the Noord Vaarder beacons, on the sandy tongue projecting westward from the island, which is working outwards, and two others on the south-east end of the Bosch. Ter Schelling has three villages, Wester Schelling, Midsand, and Hoorn; the spire of Midsland is a prominent object near the middle of the island. It has 2,743 inhabitants, and the men are chiefly employed as seamen, pilots, and fishermen.

Beacons.—The Noord Vaärder beacons are 490 yards apart; the northernmost, which is the smallest, has a square head, and the southernmost a round one.

LIGHTS.—Vlieland lighthouse is chiefly for the use of vessels navigating the Vlie stroom, and stands above the village, on the highest sand-hill at the east end of the island. It exhibits from a red stone tower, 151 feet above high water, a *fixed* light. The light is obscured between the bearings of S.W. by S. and S. by E., shows *red* from N.E. round by east to S. by E., and is visible at a distance of 9 miles, and white in the direction of the North-east gat, or between the bearings of S.W. by S. round by west to N.E. by N., for a distance of 12 miles.

1. **Ter Schelling** lighthouse is upon Brandaris tower, a tall square structure with a flat roof, near Wester Schelling, and one of the most distinct objects on the whole coast. It exhibits, at 177 feet above high water, a white *fixed* light of the first order, and in clear weather it may be seen from a distance of 22 miles in every direction.

2. On the western sand-hill, a guiding light is exhibited from a wooden support, bearing W. ¼ N. nearly, distant 436 yards from Brandaris lighthouse.

The light is a *fixed* light, showing white from seaward between the bearings of South and N.E. (on this bearing it leads over the position of Schuitengat black buoy No. 4); and *red* between the bearings of N.E. and N.N.W., and is elevated 49 feet above ordinary high water, the white light being visible in clear weather from a distance of 8 miles, and the red light about 4 miles.

3. West Ter Schelling light is *fixed* and visible round the horizon, it is placed 600 yards to the south of Brandaris tower.

Harlingen.—A *fixed* white light is exhibited at 56 feet above the sea, from a stone tower on the town rampart; the light can be seen at a distance of 10 miles.

A *fixed red* light is shown on the head of the North mole.

The two lights in line lead up to the entrance of the haven, through the channel dredged in the "Pollen," between the beacons on the current guiding dam on the south, and the black buoys to the north. The least depth at low water in the channel is 7¼ feet.

HARLINGEN, in the Province of Friesland, is connected by a canal with Leuwarden, 16 miles distant. The town has regular steam communication with Amsterdam, and carries on a trade with Britain, Norway, and the Baltic. Population 8,590.

VLIE STROOM, the passage between Vlieland and Ter Schelling, is used both by vessels seeking shelter, and also by those from the north-eastward bound to Amsterdam, and to Harlingen and the harbours in the Zuider zee. It has four channels, which are liable to change, necessitating alteration in the buoyage, the Zuider Storte-melk, the Noorder Storte-melk, the Thomas Smit gat, and the N. O. or North-east gat. The outer buoys are also liable to break adrift during stormy weather.

Zuider Storte-melk, by far the best entrance into the Vlie stroom, and with 3½ to 4 fathoms in it at low water, is between Noorden Buitengrond to the north-eastward, and the flat shore of Vlieland to the south-westward. It is marked by a nun buoy painted in black and white vertical stripes with staff and ball, lying N. by W. 2⅓ miles from Vlieland lighthouse, and three black buoys to the north-eastward, and one buoy quartered red and white, and three white buoys, the innermost having a red border, to the southward.

Noorder Storte-melk trends from the same entrance as the last, in an E.N.E. direction for 2½ miles, and then rounds sharply to the east-south-east southerly for the main channel; besides the black and white striped beacon buoy last mentioned, there are in the first reach, three black and three white buoys.

Thomas Smit Gat has an entrance 4½ miles N.E. by N. of the last, its direction is about E. by S. for a mile, then South 4½ miles for the main channel, passing the steep bank of the Noord Vaärder on the port side; the northern entrance is marked by a red beacon buoy and one black one, and by four white ones on the south and west sides. The red buoy bears N.E. by N. ½ N., 4½ miles from the Storte-melk buoy, and W. ½ S. 3 miles from the North-east gat buoy; in the channel there is not less than 3¾ fathoms.

The N. O. Gat, between Ter Schelling bank and Noord vaärder on the east, and Noordgronde and Westergronde on the west, having 13 feet water on the bar, is principally used by vessels from the north-eastward. The fairway of its entrance is marked by a red and white vertically striped nun buoy lying with the Noord Vaärder beacons in line. The passage is then marked by black buoys, to the south-eastward, and one white buoy, to its junction with Thomas Smit gat, to the north-westward; the innermost of the two white buoys beyond bears the name of the English Hook buoy. A red buoy marks the point where the Noorder Storte-melk diverges from the N. O. gat, the buoy lies in 5½ fathoms water at the south-east end of the Westergronde. The same arrangement of buoys marks the channels in the various directions branching from the junction of those described to Vlie road, West Ter Schelling, Harlingen, and the ports in the Zuider zee.

PILOTS for the Vlie stroom are always to be obtained, even in the worst weather. Their vessels carry the name *Ter Schelling* on the mainsail, and also a blue flag and number.

Life Boats.—There is a life boat station near Ter Schelling lighthouse, a second about the centre of the island, and a third at the east end.

DIRECTIONS.—The Storte-melk is approached from the northward by keeping the black windmill on Vlieland between the middle and westernmost of the three beacons, but rather nearer the western one, S.S.E.; and from the westward, with Brandaris tower, on with a distinct gap in the sand-hills at the west end of Ter Schelling, just to the southward of the southernmost beacon, East. The course through the Zuider (South) Storte-melk is E.S.E. between the black and white buoys, and when the innermost of the white buoys lying upon the outer edge of the flat from Vlieland has been rounded, haul to the southward, and anchor in the Vlie 1½ miles within the eastern part of Vlieland.

By night, Vlieland *red* light bearing S. by E. leads to the Storte-melk Outer buoy.

The Noord Vaärder beacons in line S. by W. ½ W. lead to the fairway buoy of the N. O. (North-east) gat, the course through which, between the black and white buoys, is S.S.W. for 3½ miles; then S. by E. to abreast the English Hook buoy, when a more southerly course will lead to the Vlie, and to the eastward of the other buoys marking the passage.

By night. Entering the Zuider zee by the north-east gat, the white guiding light will be seen westward of Brandaris light; and in proceeding through the gat, when those lights come in line, bearing E. ¼ S. nearly, the vessel will be southward of the western point of Noords Vaärder, and the course may be altered for the Schuitengat.

Navigating the Schuitengat, the guiding light changes colour from white to red when abreast the inner black buoy, No. 4, on the south point of Noords Vaärder, and the vessel may then steer towards Terschelling harbour white light, till just westward of the harbour, when the red guiding light becomes obscured by the sand-hill.

TIDES.—It is high water, at full and change, at West Ter Schelling at 8h. 40m., springs rise 6 feet; and at Harlingen at 9h. 0m., springs rise 5½ feet.

CAUTION.—The flood stream for the first 4 hours runs across the channel of the North-east gat, and for only 2 hours through it, whereas in the West gat both streams set fairly through. The Vlieland light is obscured between the beacon buoy of the Storte-melk and to a little East of the N. O. (North-east) gat buoy.

AMELAND, the next island in succession to Ter Schelling, lies at an average distance of 6 miles from the main. It is 11½ miles long in an E. by S. ½ S. and W. by N. ½ N. direction, and 2½ miles wide, and has three villages on it, Nes, Ballum, and Hollum; the church of the latter place, near the west end of the island, with several windmills and beacons, are the most prominent objects. The island is generally flat, and occasionally suffers from inundations; its pastures feed cattle which are reared for exportation, but the principal dependence of its population, amounting to 2,100, is upon fishing and seafaring.

LIGHT.—An iron stand is erected on the westernmost sand-hill of Ameland at about 550 yards S. ½ E. from Hollum beacon, from the summit of which is exhibited a *fixed* white light at an elevation of 49 feet above the sea, which is visible in clear weather for a distance of 12 miles, between the bearings of S.W. by W. (round by east) and N.W. by N. The light is intended chiefly for the use of fishing vessels.

Ameland gat, between Ameland and a sandy track named the Bosch extending from Ter Schelling, has two entrances, Middle gat (Akkepolle gat), and the North-west gat; a third entrance, the North-east gat, has of late years become sanded up.

Beacons.—On the south-east end of the Bosch are two beacons for guiding vessels into Ameland gat; they are about one-third of a mile S. by W. ½ W. and N. by E. ½ E. from each other.

Buoys.—It is to be remarked, that the order of the buoys as to colour, which usually prevails on this coast, is in and eastward of Ameland gat reversed, *black* buoys lying to the westward, and *white* buoys to the eastward.

Middle gat has a red buoy moored in the fairway on the line of the two Bosch beacons bearing S. by W. ½ W., 3½ miles, and Hollum church S.S.E.; it lies in about 5½ fathoms of water, and on the bar within, which is about half a mile wide, there is 12 feet; the channel to its junction with the North-west gat is marked by two black and two white buoys; the direction up from the fairway to the black buoy off the Bosch is S. by W. ½ W., 2½ miles.

The North-west gat is close along the Bosch. Hollum church on with a beacon on the sand-hills, bearing S.E. by E., leads over the bar; within there is a depth of from 7 to 10 fathoms, but the channel is very narrow in some places.

As both these entrances are constantly liable to change, and have not more than 9 to 12 feet depth at low water, they are only fit for small craft, and a farther description would be more likely to mislead than otherwise. A customs vessel lies 4 miles up on the east side.

Pinke gat is a small and intricate passage round the east end of Ameland; it nearly dries in some places.*

Life-boats.—There are two life-boat stations on Ameland island, one at the west and the other at the east end.

SCHIERMONNIKOOG, the easternmost of the islands off the coast of Friesland, and lying 5 miles outside the mouth of the Lauwer zee, is 3½ miles long and one mile wide; the eastern portion of the island is a bare sand-hill, but the other parts afford some good pasturage for cattle. On the west end of the island is the little village of Schiermonnikoog, with a church and mill. There are about 900 inhabitants, who derive their chief support from fishing.

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* *See* Admiralty chart:—Ameland to Jade river, including the river Ems, No. 2,593; scale *m* = 0·5 of an inch.

LIGHTS.—The two lighthouses on the sand-hills near the western end of Schiermonnikoog island, are tall circular red towers, which serve as good distinguishing marks, and exhibit *fixed* white lights. They stand S.E. by S. and N.W. by N., 1,102 yards from each other, and are apparently of nearly equal height when viewed from the offing. The lights are respectively 147 and 139 feet above high water, and are visible in clear weather at a distance of 18 and 16 miles; the North one between the bearings, from seaward, of W.S.W. and E.S.E., the South light between W.S.W. and North; both lights when seen should clear the banks off the mouth of the Ems; the south limit of the North light, the dry sands off Ameland; and the South light shows up the channel.

Life-boat.—There is a life-boat station near the village of Schiermonnikoog.

FRIESCHE GAT, the channel leading towards the Lauwer zee and Groninger, is between the sands extending from Schiermonnikoog and Englishman's flat, and adjoining sands to the eastward of Ameland. There are three passages over the banks which are always working eastward, the North-west gat becoming the North gat which in turn becomes the North-east gat, the old North-east gat disappearing on the Kuipersbult or against Schiermonnikoog. While these gats are working eastward a new North-west or Plaat gat is forming on the north side of the Englishman's flat, between it and the black buoys on the west side of the North-west gat. From the constant changes occurring in these channels a stranger should not attempt them without a pilot.

The North-west gat has a red and white horizontally striped beacon buoy in the fairway of its entrance, with 10 to 12 feet at low water on the bar which is between the outer black and white buoys, within which there are from 3½ to 6 fathoms water.

The North gat has a red conical buoy in the fairway of its entrance, and like the North-west gat has a bar. Up the channel within the junction of these two gats at their inner end, there are from 3½ to 6 and 10 fathoms.

In the new channel forming close along the Englishman's flat, a black and a white buoy have been placed to indicate the fairway. This channel with westerly winds is sometimes used by the pilots. In all these channels the black buoys are on the starboard side going in, and the white buoys on the port.

On the Englishman's flat are two beacons bearing N. by E. ½ E. and S. by W. ½ W. about 600 feet from each other; with Schiermonnikoog high lighthouse bearing E. ½ N. a little over 4 miles from the South or great beacon. Over the Wierummer grounds on the west side of the gat there are several other buoys and beacons leading up swatchways for small coasting vessels only.

The Bosch plaat, and the several channels running into Groninger Wad, are between Schiermonnikoog and Rottum.

ROTTUM ISLAND, 7 miles East of Schiermonnikoog, is 3 miles long E.S.E. and W.N.W., and lies at the west entrance of the river Ems; its eastern end being 3 miles S.W. from the west end of Borkum island.

On the west end of Rottum island there are two beacons 90 feet high, and a cottage with a red roof and single chimney.

BORKUM ISLAND is between the two outlets of the river Ems, named the Western and the Eastern Ems. The island is about 5 miles long and 2 broad, and 14 miles in circumference, with sand-hills at each end. At high water, the sea almost flows through a hollow, and divides it into two nearly equal parts. The inhabitants, 500 in number, reside in a village at the west end. Most of the men are seamen, and the remainder support themselves by husbandry and the rearing of cattle.

Borkum island is connected with an extensive series of sands, having a general N.N.W. and S.S.E. direction; those landward are termed the Randzel, and those seaward Borkum reef.

Beacons.—Near the church at the west end are three brick beacons, which at a distance resemble gothic arches, the East Ems 109 feet high, having a triangular head. The West Ems 97 feet high, having its summit in the shape of an hour glass; and the Riff gat or New beacon 68 feet high with a square head. There is also a brick beacon called East-land, 51 feet above high water with a triangular top, upon the eastern extremity of the island.

Life-boats.—There is a life-boat on both the east and west ends of Borkum island. Weather signals are made from the island.

A Telegraph cable extends from the east end of Borkum island to Juist which is in connexion with Emden, and with Cromer in England. The cable between Borkum and Juist is marked by four telegraph buoys, and captains of vessels are cautioned not to foul it with their anchors.

BORKUM FLAT stretches out fully 27 miles North and N. by E. from Borkum island, and is commonly sounded upon by vessels bound to the Weser or Elbe, for the purpose of checking their distance. The bottom is principally coarse white sand, with small yellow or red stones, with black or white gravel, and occasionally with red or white shells. The depths upon the flat vary between 13 and 17 fathoms, and are less by one to 1½ fathoms than the depths on either side; this fact, taken in connexion with the quality of the bottom, renders it extremely useful for the purpose above stated. The light-vessel serves now as an excellent guide for vessels.

LIGHTS.—Borkum island light is exhibited from the summit of the church tower, which is built of red brick, and quadrangular. It is a *fixed* white light, 134 feet above high water, and may be seen 18 miles off in clear weather, seaward between the bearings of East and West. Up the river an arc of light is shown between the bearings of N.N.E. ½ E. and N.W. by N., or in the channel between the Hubert and Meeuwen steert flats.

Light-vessel.—Borkum flat light-vessel is moored in 13 fathoms water, bearing N. by W. distant 18 miles from Borkum lighthouse. The vessel exhibits three *fixed* lights, on separate masts, viz.: a *red* light on the main-mast, and a white light on the fore and mizen-masts; the *red* light at an elevation of 46 feet, and the white at 36 feet above the sea, and in clear weather visible from a distance of 8 miles. In the day-time the vessel will carry a black globe on the fore and mizen-masts, and a pyramidal basket cage on the main mast. By night, a riding light is carried on the fore-stay about 5 feet above the rail. When a vessel is seen steering a wrong course, two guns will be fired in quick succession, and the danger signal of the *International code* hoisted. When the vessel is not in her station, neither the day-marks nor the lights will be exhibited.

In foggy weather the ship's bell will be sounded during *one minute*, with intervals of *two minutes*.

River Lights.—At Delfzyl on the west bank, 20 miles above Borkum there is a small *fixed* light at the north entrance to the port, visible 3 miles, off which is good anchorage. There is also a *fixed red* light at the inner harbour.

At Knock, 4 miles across the river, and where it turns sharp round to the eastward for Emden, at 5 miles below the city, is a *fixed* light on the dyke, elevated on a wooden beacon 29 feet; it should be seen 8 miles between the bearings of South and N.W. by W. ½ W. by the east.

Termunterzyl light on the opposite side of the river to Knock, is a *fixed* white light at the entrance of the port.

TIDES.—It is high water, full and change, at Ameland at 9h. 30m.; springs rise 6¼ feet; at Schiermonnikoog 9h. 40m., at Rottum 10h. 0m., at Borkum (W.) 10h. 30m., at Borkum (E.) 10h. 30m., at Delfzyl 11h. 15m., at Emden at 0h. 34m. and the average spring rise is from 5¾ feet at Schiermonnikoog to 9 feet at Emden.

DIRECTIONS.—Borkum flat is about 57 miles from Helgoland, but if during northerly winds and thick weather a vessel should pass outside the flat, and the estimated distance from the island be 21 or 24 miles, with a depth of 17 or 18 fathoms, soft muddy ground, it will be well to heave to, as she may be to the eastward of her reckoning, which often occurs. It is essentially requisite that before closing the Elbe a sight of Helgoland, or soundings off the coast, should be obtained, for there is soft ground both in the parallel of and 18 or 21 miles to the northward of Helgoland; and in many instances vessels, from not observing the precaution here recommended, and supposing themselves to be off the coast in 18 or 19 fathoms, have stood to the S.S.E., got into 14 and 15 fathoms, coarse sand and small stones, leading them to imagine themselves on Borkum flat, and have eventually found themselves several miles to the northward of Helgoland.

DISTRESS and PILOTAGE Signals.—The following signals have been adopted by the Governments of England, Germany, and Holland.

Distress signals. (*a.*) In the daytime: (1.) A gun fired at intervals of about a minute; or (2.) the distress signal "N.C." of the *International code*; or (3.) the distant signal, consisting of a square signal flag, with a ball or some similar object either above or below it. (*b.*) By night: (1.) a gun fired at intervals of about a minute; or (2.) flames produced by burning tar-barrels, oil casks, &c.; or (3) rockets or shells of any kind or colour discharged, one at a time at short intervals. These signals must only be used by vessels when they are in distress or danger. Pilotage signals.—(*a.*) In the daytime:—(1) the Imperial Pilotage flag hoisted at the fore, having a white border round it one-fifth the breadth of the flag; or (2) the Pilotage Signal "P.T." of the *International code.* (*b.*) By night:—(1) Blue light every 15 minutes; or (2) a bright white light shown at intervals immediately above the bulwarks, and visible each time about a minute. These signals must only be used by vessels when pilots are required on board them.

The RIVER EMS rises 28 miles south-west from Minden; it then flows S.W. and N.W. through Westphalia; traverses the western section of the former kingdom of Hanover, to the wide expanse named the Dollert, near the town of Emden, 30 miles below which, after a westerly and north-westerly course, it joins the sea by the Western and Eastern Ems. For the last 15 miles of its course the Ems has a wide estuary, which is principally occupied by Borkum island and the sands connected with it.

All the Ems ports are tidal, and with the exception of at Leer, vessels generally ground at low water alongside the wharves. Vessels of 120 to

240 tons are built at Emden, Leer, Papenburg, Werner, and Imgum, and they have occasionally been built of 500 tons burthen. There are no docks or patent slips, but vessels can be repaired at the above-named places.

EMDEN has a population of 15,000 inhabitants, and carries on a considerable trade, especially in oats. It is connected with Hanover by a railway. A submarine telegraph connects Emden with Borkum, and Weybourne near Cromer.

WESTERN EMS begins at the upper part of the Randzel, and has a general N.W. by N. direction between the islands of Borkum and Rottum, to its junction with the sea.

The Western Ems, which is wider and more direct than the Eastern Ems, is between Borkum reef and the Randzel to the north-east, and Huibert plaat (abreast Rottum), Horsborn sand, and Uithuizer wad to the south-westward. It has two middle grounds,—the Geldzak or Geldsack plaat, which divides the entrance into two channels, the South channel and the Riff gat; and the Meeuwen steert, between the Horsborn sand and the Randzel.*

Buoys.—The entrances of the Western Ems are on either side of the Geldzak plaat. Off the entrance of the Western Ems is placed a nun buoy painted with red and white horizontal stripes and having a staff and vane; the buoy lies in about 8 fathoms water with the two beacons on Rottum island in line; the South channel is marked by three white buoys, lettered W. and numbered, on its north-eastern side; the outer of which, a nun, lies in 21 feet. The western flat and Huibert plaat to abreast Borkum, are marked by black buoys, the outermost of which, a nun of large size, with staff and eagle, lies in 4½ fathoms. The other buoys lie in succession in a southerly and easterly direction.

Riff gat, the northern channel between the Geldzak plaat and Borkum reef, which has improved in width and depth of late years, is marked out by white buoys to the eastward, and red buoys to the westward.

The outer red buoy with a staff and ball lies in about 7 fathoms, at 3 miles E. by S. of the Western Ems outer buoy, with Rottum N.W. beacon open West of the lower one, S. ½ E. The eastern side of this channel is marked by five white buoys to abreast of the High reef off Borkum; and the western side, along the edge of the Geldzak, by three red, lettered A., B., and C., the inner (C.) buoy having a staff and ball.

Above Huibert plaat, the channel of the Western Ems to its junction with the Eastern Ems follows the edge of the western flat. It is marked to the westward by five black buoys (the upper a nun), lying at the north-east side of the Ems Horn. The channel to the northward of the Meeuwen steert, or Randzel gat, is barred at the south-east end; it is buoyed on the east by one vertically striped, off Fischer Balge, three white and a vertically striped buoy off the south-east edge of the Randzel; and by a black nun on the north end of the Meeuwen steert and five other black buoys on its eastern side.

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* Mariners are cautioned that the sand-banks at the mouths of the Ems are frequently shifting, and that during the winter months the river is liable to silt up, the channels consequently alter, and require re-marking in the spring.

DIRECTIONS for the Western Ems.—It must be remembered that the flood sets S.E. and the ebb N.W. across the Geldzak. In using the South passage bring the southernmost beacon on Borkum island on with the church about S.E. by E. ½ E., and when the two beacons on Rottum island are in line S.S.E., steer to the S.E., passing between the black and the white buoys until between the black buoy off Rottum island and the white one on the tail of the Geldzak plaat, keeping the black buoys on the starboard hand; then keep more to the eastward, passing to the eastward of the black buoys upon the Huibert plaat.

The mark for entering the Western Ems by the Riff gat, is Borkum church on with the new beacon, S.E., until abreast of the outer red beacon buoy, when a course between the red buoys on the starboard side and the white buoys on the port, will lead to the main channel up to abreast the white buoy off High reef, which is here about 2 miles wide, and with 7 to 9 fathoms in it.

From the Huibert plaat, a more southerly course for 2½ miles will lead between the Meeuwen steert and the Horsborn sand to the westward, taking care of the flood which sets right across to the eastward, and then the channel curving to the south-eastward will be found sufficiently marked out by the buoys, but the lower portion of it is narrow, and its western side is steep.

Anchorage.—There is secure anchorage about 2 miles above Horsborn sand anywhere abreast the Meeuwen steert, rather over towards the black buoys on the edge of Uithuizer wad, in 11 to 9 fathoms at low water, good holding ground.

The junction of the Western with the Eastern Ems is 4 miles above this anchorage.

The aid of a pilot is recommended, as the channels and buoyage are so constantly altering, and it is indispensable in proceeding to the higher portions of the Ems, an acquaintance with the locality being necessary for the recognition of the clearing marks.

EASTERN EMS is formed between the Juister reef, Kachelot flat, Memmert isle, Koper, and Schuiten sands to the north-eastward, and Brouwers plaaten (the eastern portion of Borkum reef) and the Randzel to the south-westward. The sides of this channel are broken, and its width is irregular; the general course through it, first S.E. by E., changes at the upper part to S. by W. It joins the Western Ems at the inner part of the Randzel.

Buoys.—Juister reef is marked by three white buoys, and by a nun buoy striped black and white, near its southern spit. The outer white buoy lies with Borkum church S.S.W., 5¼ miles; and the middle buoy S.E. ¼ E., 1¼ miles. Above the spit of Juister reef the channel is much wider, and its eastern side is marked by white buoys lying upon the outer edges of the bounding sands.

The south-western side of the Eastern Ems is marked first by a large black nun-buoy at the outer end of Borkum reef, in 8 fathoms, with Borkum church and the high beacon S. by E. easterly 6⅓ miles; Rottum N.W. mark S.W. by S. ¼ S., and the outer white buoy on Juister reef E.S.E. 3½ miles. Borkum reef is further marked by five black buoys.

No. 6 buoy is nearly west of and only a third of a mile from the striped buoy on the spit of the Juister reef; it marks the narrowest part of the channel. Farther on, the western side is marked by black buoys and one red buoy, the latter being at the upper part of the Konings or Kings plaat, a projection of the Randzel. The buoys are lettered O. and numbered from outside.

Caution.—As a general rule to strangers, a pilot should be taken for the Ems, for the channels are intricate and the tide streams rapid.

DIRECTIONS for the Eastern Ems.—The least depth in entering the Eastern Ems, 2½ fathoms, is between the end of the Juister reef and Brouwers plaaten. Approaching from seaward, close Borkum island, with the church bearing S. by E., when it will be in line with the high beacon, and will lead to the outer black nun buoy on the Borkum reef. From a position half a mile northward of this buoy, the course will be south-easterly for about 7 miles to the sixth black buoy. Here the channel is very narrow, and between the black and white striped buoy and No. 6 black buoy, carries 3½ fathoms at low water. The position of the black and white buoy is indicated by East-land beacon on the east end of Borkum bearing S. by W. ½ W.

Above the seventh black buoy the channel is much wider, but the eastern side is very steep. From the striped buoy on the Juister reef a course S.E. ½ E. will lead to No. 11 black buoy, on the Koningston, at the north-east side of the plaat. Anchorage may be taken below the buoy in 9 fathoms. In this portion of the channel the flood stream sets strongly upon the Randzel.

A course S. by E. southerly leads from the Koningston to the red buoy at the upper end of the Konings plaat, above which the channel becomes narrowed to about one third of a mile, and is named the Wester Balg. The Wester Balg has three white buoys on its eastern, and three black buoys on its western side, and about a half a mile to the northward of the middle black buoy is secure anchorage in 3½ and 4 fathoms at low water. Here a pilot may be obtained.

In proceeding higher up than the Wester Balg a vessel will carry 9 or 10 feet at low water, and may pass over the flat connecting the south-east portion of the Randzel with the flat from the eastern shore, between O. 15 black, and on either side of the white beacon buoy, which lies in the fairway. Having crossed this flat, the main stream of the Ems will have been entered, and the course upwards has black buoys to the westward and white buoys to the eastward; the channel for the most part following the Netherlands or western shore.*

ASPECT of COAST.—The low sandy islands, Juist, Norderney, Baltrum, Langeroog, Spiekeroog, and Wangeroog, lie at the average distance of 4 miles from the coast of East Friesland, and extend as a continuous chain in an E. by S. direction for the whole distance between the Eastern Ems and the mouth of the Jade. The spire of Esens church is a remarkable object 194 feet high, it can be seen over Langeroog. The numerous channels dividing these islands from each other and the shore, afford to the small craft of the country the means of communication between the Ems and the Jade and Wester, to which description of vessels only they are available; most of them have two or more buoys marking the entrance, black as before on the starboard hand.

Juist, the first island eastward of the Ems, is about 8½ miles in length, and a half a mile wide, and on it are two small villages; a mile south-west of its west end is the sandy isle of Memmert.

Norderney, the next, is about 7 miles long, with three conspicuous white sand-hills on the eastern part, and a village at the west end, where there are two remarkable buildings, each having a small steeple; the church it 65 feet high, but without turret or steeple. The channel leading to the village is buoyed. At the west end of the island on a hill, is a wooden beacon in the form of a portico 134 feet high, surmounted by a triangle with the apex downwards; south of it is also a mill. A telegraph cable connects Norderney with Juist and the continent.

Baltrum island is about 3 miles in length, and lies next eastward of Norderney, on it are two clusters of houses.

Langeroog is composed of three portions, Westerende, Melk Horn, and Oosterende, and is about 6 miles in extent. The chief village is on the west end, near to which on the rise are two beacons, that to the north-east is in the form of a pyramid 96 feet high, that to the south-west 125 feet high, it is also a pyramid, they are surmounted by triangles, the north-east with its apex upwards, and the south-west with it downwards.

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* Kromme gat, the passage between the Schaape sand and Juister reef has disappeared, and the buoys which marked it have been removed.

Spiekeroog is 3½ miles long, with sand-hills to the westward, behind which is the village.

Life-boats.—There are two life-boat stations on Juist, one at the western end and another near the middle of the island at the village of Loog; there are also on Norderney, two stations, one at each end of the island; on Baltrum there is a station on its northern side; and a station on the north-west part of Langeroog; and another station on Spiekeroog.

LIGHT.—A lighthouse 175 feet in height, stands near the centre of Norderney, a *flash* white light is exhibited from it, showing *a flash* at intervals of *ten seconds*, at an elevation of 195 feet above high water, and which should be seen in clear weather from a distance of 20 miles.

WANGEROOG.—The mouths of the Jade and Weser are bounded to the westward by Wangeroog, a low sandy island, about 2¼ miles long E.S.E. and W.N.W., and half a mile broad. A village stands upon the west extremity of the island, and the tower of its church is one of the most prominent objects upon the coast.*

Telegraph.—There is a telegraph cable laid from Wangeroog to Carolinen Siel on the mainland opposite, which is in connection with the Continent and England. A semaphore belonging to the telegraph station communicates with the sea by means of the *International Code* of signals.

Ice Signals.—Signals are hoisted from the signal station on Wangeroog, signifying to ships coming from sea the condition of the ice in the river Jade. The signals are made with a ball, a cylinder, and a cone, and can be seen from between the bearing of S.E. ½ E. round by south to S.W. ½ W.

A ball - - - -	ice moving everywhere;	the entrance of the port is impracticable.
A cylinder - - - -	do.	the entrance of the port is practicable, but the lock gates impracticable.
A cone with the point up - -	do.	the entrance to the port and lock gates practicable.
A ball over a cylinder - -	ice moving in the river;	the entrance of the port impracticable.
A ball over a cone with the point up -	do.	the entrance of the port is practicable, but the lock gates impracticable.
A cone with the point up over a ball -	do.	the entrance of the port and lock gates practicable.
A cylinder over a cone with the point up,	a little ice in the river;	the entrance of the port impracticable.
A cone with the point down over a ball -	do.	the entrance of the port practicable, but the lock gates impracticable.
A cone with the point up over a cylinder -	do.	the entrance of the port and lock gates practicable.
A cone with the point down -	there is no ice.	

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* *See* Admiralty chart of the Elbe river, &c., No. 1,875; scale, m = 0·5 of a

LIGHTS.—Wangeroog lighthouse is a white brick column 100 feet high, near the eastern extremity of the higher portion of the island. The light is *revolving*, showing a bright face once *every minute*, the duration of the light is from *twelve to fifteen seconds*, that of obscurity from *forty-five to forty-eight seconds*, and is of the fourth order; it is placed at the height of 108 feet above the mean level of the sea, and should be visible from the deck of a ship in ordinary weather at a distance of 12 miles.

Beacons.—There is a beacon 50 feet in height on the sand-hill 566 yards N. by E. ½ E. from the lighthouse; the Key buoy of the Weser, and No. 1 and A. buoys of the Jade, are placed nearly with the two in line. On the sands east of the island are two other beacons, the farthest with a triangular summit and vane on the Minsener Old Ooge bears S.E. by E. ½ E. 4¼ miles from the lighthouse; the other stands about mid-way between the outer beacon and the island, and is in the form of two cones joined at their points like an hour glass.

Mellum beacon on the west side of Old Mellum sand is 70 feet high, and built of wood in the shape of a pyramid. The upper part is covered with laths, and forms a small room for shipwrecked people.

Light-vessel.—The Weser light-vessel off the entrance of the Jade and Weser is moored in 12 fathoms water, N. ¾ W., 7 miles from Wangeroog lighthouse. The vessel has three masts, and is painted red, with her name *Weser* in white letters on her sides, and carries a red cage at each mast head in the day time. A *fixed* white light is exhibited at each mast head, at 39 feet above the sea, and are visible in clear weather at the distance of 8 miles. A riding light will be hoisted on the fore-stay 6 feet above the rail, and when the vessel is out of position, neither the lights nor the cages will be shown, but a black flag will be hoisted at the gaff. During thick and foggy weather, a bell will be struck *five* times *every two minutes*. When vessels are observed steering a wrong course, a gun will be fired, and signals made in accordance with the *International Code*.

JADE RIVER.—Two middle grounds or sands, of which Jade flat is the northernmost, separate the mouth of the Jade from that of the Weser. The south-west side of the channel is formed by the shallow ground projecting from Wangeroog; 6 miles within the entrance the channel turns to the southward, and is then confined between the extensive flats of Mellum and Hohe Weg to the eastward, and the flats from the shore of Oldenburg to the westward. At 25 miles from the sea the shores of the Jade recede, and form an extensive circular basin: the source of the river is near Rastedt, 15 miles above it. The whole length of the Jade may be assumed as 50 miles.

WILLIAMSHAVEN.—The port of Williamshaven is on the west side of the Jade, 23½ miles above the entrance. The German government has a dockyard here, having two slips for building men of war of the largest size, on one of which the *Gnosser Kurfürst* of 4,118 tons, an Ironclad, was built: there are also three dry docks for repairing vessels, two 440 feet long, 84 feet wide, and in which vessels of 29 feet draft can be admitted, and the third 380 feet long for smaller iron-clads, corvettes, &c. In the stream there are 7 fathoms water, where vessels can lie moored. A railway connects Williamshaven with Oldenburg; the trade of the port is very insignificant. The climate is considered to be unhealthy.

Buoys.—The entrance of the Jade is marked by a red truncated bell buoy surmounted by a mast with a ball and vane, and by red truncated conical buoys to the south-west, and black buoys to the north-east, the former being upon the outer edge of the flat from Wangeroog, and the latter upon the south-east edge of the Jade flat and on the Minsener sand, The red buoys are lettered consecutively from the outside, from A. to G., and the black ones numbered from 1 to 8.*

The Bell buoy bears S. by W. ¾ W. 20 miles from Helgoland; North 3¾ miles from Wangeroog lighthouse, and W.S.W. 1½ miles from the Weser Key buoy; and the buoys G and 10, where the narrows open into the broad channel of the Jade, between Old Mellum sand on the east and the flats off the mainland on the west, are nearly on a line with the two beacons on the sands, and S.E. by E. ½ E. from Wangeroog lighthouse. The channel in its narrowest part is less than half a mile wide, and it carries from 4½ to 6 fathoms at low water; but the sands forming it are subject to change, involving a corresponding alteration in placing the buoys, which also owing to the ice, at times break adrift.

A buoy for swinging ships at, lies in 34 feet water in Williamshaven road, with Varel lighthouse bearing S. 1° 10′ E., Williamshaven church N. 78° 25′ W., and Holham church S. 85° 30′ E. (true).

RIVER LIGHTS.—A light-vessel near the north-west end of Minsener sand, with three masts, painted red, having her name *Aussen Jade* on her sides, is moored in 6 fathoms water; by day she carries a black ball on the fore, and one on the main mast, and the North German pilot flag is hoisted. She exhibits two *fixed* white lights, one on the main and the other on the fore mast, at 51 feet and 31 feet respectively above the sea, visible in clear weather for 9 miles; during a heavy sea the lights may be lowered to 41 and 26 feet. If the vessel is out of position no balls nor lights will be exhibited, but a black square flag will be hoisted at the main. During fogs a bell will be sounded for *a minute*, at intervals of *three minutes*. Vessels steering a wrong course will be warned of their danger by the firing of a double discharge every three minutes, sounding the bell, or by signals of the *International Code*, and the proper course will be indicated when possible.

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* An automatic (or self-acting) signal has been placed for trial on the channel buoy B at the entrance of the Jade. Trials made with this signal buoy show that in normal conditions of the weather, and with the wind, the blasts could be heard from a distance of 4 to 5 miles, but that in stormy weather the sound was so overpowered that it could only be heard from a distance of half a mile. December, 1877.

A light-vessel lies in 9 fathoms water near the west edge of Mellum sand, and to the south-eastward of Minsener sand, the vessel is painted red with *Minsener sand* on her sides, and has three masts, with a ball at the main-mast, she exhibits a *fixed red* light at 51 feet above the sea.*

At Schillighörn, eastward of the mole, near the village on the Groden, the north-east point of the mainland on the west side of the entrance of the river, two lights are exhibited from the same tower.

The upper is a *fixed red* light, elevated 69 feet above high water, and should be visible in clear weather, between the bearings of S. by W. and S.W. ½ W. from a distance of 12 miles; and between the bearings of S.W. ½ W. and N.N.W. ½ W. from a distance of 9 miles.

The lower is a *fixed* white leading light, elevated 59 feet above high water, and should be visible in clear weather between the bearings of N. 25° W. and N. 28° W. from a distance of 11 miles. This light is only visible in the fairway of the channel, and attains its greatest brilliancy very nearly in the direction of mid-channel.

The light tower, painted a dark colour, is an iron column on a stone base. The roof is dome shaped, surmounted by a ball 76 feet above the ground.

A telegraph and signal station, to announce cases and signals of distress, will be established at Schillighörn lighthouse. The *International Code* of signals only will be used.

At Varelersiel two lights are exhibited from a lighthouse erected on Schlaf mole, northward of Varel. The light tower is similar to that at Schillighörn, but is 96 feet high.

The upper light is a *fixed red* light, elevated 89 feet above high water, and should be visible in clear weather between the bearings of S. 39° E. and S. 13° W.; and from S. 16½° W. to S. 69° W., from a distance of 13 miles.

The lower light is a *fixed* white leading light, elevated 79 feet above high water, and should be visible in clear weather between the bearings of S. 13° W. and S. 16½° W. from a distance of 13 miles. This light is only visible in the channel, southward of Genius bank to Williamshaven, and attains its greatest brilliancy nearly in the direction of mid-channel*.

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* During the winter months, the light-vessels in consequence of the ice are liable to break adrift, or be temporarily removed.

At Hook Siel there is a small *fixed* light on the west side of the river, 9 miles above Minsener Old Ooge; the light is exhibited at 27 feet above the sea from a stone tower, and is visible for 6 miles.

At Williamshaven on the same side a *fixed green* light is exhibited on the north mole head; and a *fixed red* light on the southern mole head.

DIRECTIONS for the JADE.—Large vessels enter by the Wangeroog channel; they should bring Wangeroog lighthouse to bear S.S.W. and steer for it until the Key buoy (page 200), which lies in the same direction, is seen; then steer to the S.W. towards the Bell buoy. From the Bell buoy a S.E. course for about 6 miles will lead up in from 4½ to 6 fathoms water, having the red buoys which are lettered from A on the western side, and the black buoys which are numbered from 1 on the eastern, to between red buoy D and black buoy 5, and abreast of "Aussen Jade" light-vessel; the course will then be gradually more southerly, still keeping between the buoys to the "Minsener" light-vessel, above which the river widens to about 2 miles in breadth for 5 miles, or as far as red buoy H and black buoy 13, when the channel, which is buoyed in the same manner, again narrows for about 9 miles to red buoy Q and black buoy 19, just below Williamshaven.

The flood tide sets over the northern part of the channel in an oblique and easterly direction. Vessels should always pass to the westward of "Aussen Jade" light-vessel.

The North channel between Jade flat and Rother grund is narrow and has 3½ fathoms water on the flat which connects these shoals. It is buoyed with two red beacon buoys on the western or Jade side, and by two black buoys on the opposite side.

By night.—Vessels entering should alter course from the line indicated by the leading light at Schillighörn, before that shown by the leading light at Varelerseil is reached, as the position where the ranges of these lights intersect is eastward of the channel fairway. Hohe Weg light is obscured between the bearings of N.E. ¼ E. and E. ¾ N. to indicate the northern and southern limits of Hook Siel flat.

The connection of the ranges of these lights will probably be made good by the establishment of a light-vessel near Genius bank.

Anchorage.—In the inner Jade from Horummersiel upwards there is good anchorage nearly everywhere, except during gales from the northward.

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* It is intended (1878) to place a light-vessel showing a *fixed* white light, near Genius bank.

Caution.—As the sands of the Jade are constantly subject to change, and no stranger should enter the river except under charge of a pilot, a further reference to its features is unnecessary. Torpedoes on trial are at times placed in the upper part of the Jade, they are marked by green buoys with the word *Mine* painted on them. Vessels should not pass over them, nor anchor near their position.

TIDES.—It is high water, full and change, at Wangeroog at 11h. 35m., springs rise 10 feet; at Williamshaven at 0h. 52m., springs rise 11¼ feet.

PILOTS.—A pilot vessel painted black generally cruises in front of the Jade, she carries at her mainmast the pilot flag used by the German men-of war, and she can also supply pilots for the Weser.

Life-boats.—There are life-boats stationed at the isle of Wangeroog, at Horummerseil in the Jade, and at Heppens near Williamshaven.

RIVER WESER.—The Weser joins the sea 15 miles to the westward of the Elbe; it is formed by a junction of the Fulda and Werra, near Münden, on the former frontiers of Hanover and Hesse-Cassel; traverses circuitously, generally towards the north, through small portions of the territories of Hesse-Cassel, Westphalia, and Brunswick; forms the boundary between Hanover and Oldenburg, and has a wide and sand-encumbered estuary. The whole course of the Weser is 250 miles in length; it receives several affluents, and in the lower portion of its course is strongly embanked to protect the country from inundation. The navigation for large vessels ceases at Bremerhaven, on the Hanoverian side of the river, 36 miles below Bremen.

The mouth of the Weser is separated from that of the Jade by the Jade flat, the Rother grund, and Mellum sand. The present channels into the Weser are between the Rother sand and Tegeler flats on the north-east, Jade flat, Rother grund, the Mellum flat, Mellum sand, and Hohe Weg flat to the south-westward; to the east of the Rother sand is another channel named Alte Weser, which joins the principal channel near the light-vessel. The Weser during the winter months is liable to silt up considerably, causing the channels to alter and require re-marking in the spring. The western channel, the one most generally used, is a comparatively modern one, for the sands at the mouth of the Weser are constantly subject to change. Both channels are buoyed.

BREMEN, one of the three Hanseatic cities of North Germany, is upon the Weser, which divides it into two unequal portions; the larger, called the old town, on the right, and the new town on the left bank; the communication is maintained by a bridge. The old town was formerly surrounded by ramparts, but they have been levelled, planted with trees, and converted into promenades. Both sides of the river are lined with quays. The principal buildings are the cathedral, an ancient structure in the Gothic style, built in 1160; the church of St. Ausgarius, with a handsome steeple 325 feet high; and the old town-hall, formerly an archiepiscopal palace. Population in 1871, 82,950.

The principal manufactures are of woollens, cotton, leather, tobacco, refined sugar, rape-oil, paper, &c., with above 100 breweries and distilleries, and several soap-boiling works and sail-lofts. There is also a considerable trade in building and fitting out vessels. At the "Weser" shipbuilding yard several iron-clad gunboats of 800 tons have been built for the German navy. The principal imports are tobacco, coffee, sugar, whale oil, cotton and cotton-yarn, wine, &c.; and the exports, linens, tobacco and snuff, bones, oak-bark, oil-cake, hams, &c. In 1871, 307 vessels, including 30 steam vessels, belonged to Bremen, of 238,418 tons; and in the same year there entered the port with cargoes and in ballast 3,237 vessels, of 577,342 tons; and there cleared in the same year with cargoes and in ballast 3,241 vessels, of 569,028 tons. The total value of imports in 1871 was 21,065,584*l.*, and of exports in the same year 19,396,577*l.* Steam vessels depart for New York viâ Southampton, also Baltimore, and New Orleans; for Havana viâ Havre; for London, Hull, and other ports. Vessels of only 7 feet draft can get up to Bremen.

A railway connects Bremen with Hanover, and thence with East, North, and Central Germany on the one hand, and with West Germany, Belgium, and France on the other. It is, after Hamburg, the principal German port for the shipment of emigrants for America. In 1871, 60,516 left on board of 230 vessels.

Brake, on the left bank of the Weser, belongs to Oldenburg, and is a free port; vessels that cannot get up to Bremen usually stop here. Vessels drawing not more than 14 feet can lie alongside the wharf, but since the opening of the wet dock it is seldom used except by fishermen and passenger boats. In the stream, vessels drawing not more than 11 feet can be moored. There are eight yards where vessels of 1,000 tons register can be built.

Geestmünde, a free port belonging to Germany, adjoins Bremerhaven, being on the opposite side of the river Geest, which is only about 150 feet wide. There is a basin with a sluice lock for large vessels, on the sides of which are several hydraulic cranes. There are two dry docks, one 350 feet long and 43 feet wide, the other 236 feet long and 41 feet wide, capable of receiving vessels drawing respectively 14 and 13 feet. Also three building yards, where vessels of 800 tons register, of 1,200 tons, or of any size can be built.

BREMERHAVEN, a free port upon the right bank of the Weser, opposite Blexen and at the mouth of the river Geest, is the proper port of Bremen, from which place it is distant 34 miles. The works consist of an outer harbour, a sluice dock, and an inner harbour, which can accommodate a great many large vessels; and since their completion in 1830 a considerable village of the same name has grown up in the vicinity, having a population of 7,500 inhabitants. There are five dry docks varying from 205 to 410 feet in length, and from 43 to 61 feet width of entrance, which will admit vessels drawing from 13 to 24½ feet. Also four building yards, where vessels of any size can be constructed. There is a pilot station, a telegraph, and a railway in communication with the continent and also connected with the harbour. Vessels requiring to enter the port of Bremerhaven hoist a flag at the main and lower it a little if a steam tug is wanted; if they want to enter Geestemünde they hoist two flags on the mizen, one above the other.

Bremerhaven is the limit of the Weser navigation to large vessels; but vessels drawing 12 to 14 feet can proceed 25 miles higher up to Vegesack, on the right bank of the river, which has a population of 4,000, and three yards for building wooden and particularly iron vessels up to 1,000 tons.*

Time ball.—A time ball has been established at Bremerhaven at 450 feet to the eastward of the lighthouse. The ball is black, and will drop twice a day, *i.e.*, at 0h. 0m. 0s., or mean noon Bremerhaven time; and at 0h. 0m. 0s., or mean noon Greenwich time, which is 0h. 34m. 16·5s. after Bremerhaven time.

Ten minutes before each signal the ball will be raised to about half its height, and 3 minutes before the signal to its full height, 130 feet above high water. If the ball should not drop at the exact time, within 3 minutes after the failure of the signal a red ball will be hoisted to the full height for 5 minutes, on one of the wires which serves as a support to the framework.

LIGHT-VESSEL.—The light-vessel in the Weser lies in the roadstead within the junction of the two channels, which is generally a position of safety. She is moored in 9 fathoms about S.E. ¼ E. 9 miles from the Schlüssel, or Key buoy; E. by S. 8½ miles from Wangeroog lighthouse; and N. by W. ½ W. 6½ miles from Hohe Weg lighthouse. This vessel exhibits from February to November, a *fixed* white light 36 feet above the water, and visible 10 miles in clear weather; she has two masts, and carries a ball at the head of one of them; is painted red, with her name *Bremen No.* 1 on her sides. Like the outer light-vessels of the Elbe, she is often forced to sea by the ice in the winter season; when not in position the light is not shown nor the ball hoisted. In thick weather a gun is fired, and a bell sounded.

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* Nordenhamm belonging to Oldenburg about 6 miles above Bremerhaven, on the left bank of the Weser, is quite a new port. The river at Nordenhamm in mid-channel is deep, so that when the harbour and other works, which are only now being commenced, are finished, the largest class of vessel may load or discharge there. It may also become a convenient place for the shipment of cattle. *Letter from* W. Ward, Esq., *H.M. Consul at Bremen, 21st February* 1877.

LIGHTS.—Hohe Weg lighthouse, on the north-east side of the flat, is an octagonal structure of brick upon a stone basement, 120 feet in height, surrounded by a terrace with an iron railing. It exhibits, at 102 feet above the mean level of the sea, a *fixed* white light, which should be visible in clear weather, from the deck of a ship, at a distance of 16 miles; it may, therefore, be seen from the outer buoy of the Weser called the Schlüssel-tonne, or Key-buoy, and is visible in all directions except between the bearings of N.E. ¼ E. and E. ¾ N. through which portion of arc it is obscured, and indicates the northern and southern limits of Hook Siel flat. From the lighthouse, the light-vessel of the Weser, *Bremen No.* 1, bears N. by W. ½ W., 6½ miles, and Langwarden church S. ⅓ E.

For the convenience of the seaman entering the Weser, but by no means to induce him to neglect the use of the lead, a small *fixed* white and *red* light is shown from the lower part of the lighthouse, at a height of 39 feet above the mean tide level; it is visible in clear weather at a distance of 6 miles. This light will disappear to a vessel that may be nearing too much the black buoy on port side on entering, and near the buoys H and J; and to those entering the channel named Dwas-gatt, it appears *red* from the anchorage or when in a line with the red buoy, and will disappear when they reach the line of the black buoys Wa and Wb.

Fedderwardersiel.—On the end of the bridge opposite Fedderwardersiel is a *fixed* white light, visible 5 miles.

Langlütjen.—On landing pier of fort Langlütjen, east side of sand, is a *fixed* white light.

Brinkamahoff.—On the pier near the fort is a *fixed* white light.

Bremerhaven.—A *fixed* white harbour light is shown from a brick tower at the entrance of the docks; the light is elevated 110 feet above the sea, and can be seen 10 miles.

Geestemünde.—Two *fixed* lights are exhibited at Geestemünde, a *red* one visible for 6 miles, and a *green* one for 4 miles. When the lights are in line they indicate the entrance.

PILOTS.—Vessels carrying the Bremen flag, and having on board pilots for the Weser, will generally be found cruising to the westward of the river; pilots will also be found on board the light-vessel.

Note.—There is an electric telegraph at Hohe Weg lighthouse, by which a message can be sent to Bremen, Bremerhaven, and Fedderwardersiel for a steam tug.

CAUTION.—It is dangerous for a vessel to enter the Weser when there is ice in the river, unless she can insure reaching either Fedderwarder or Bremerhaven; Fedderwarder being the more available under such circumstances with westerly winds, and Bremerhaven with easterly winds. When the attempt would be attended with risk, it is better to seek shelter at Helgoland or Cuxhaven. As some guide *see* Ice signals, page 191.

Buoys.—The outer buoy at the mouth of the Weser is a black nun of large size with a gilt key upon it, and hence termed the Schlüssel or Key buoy; it lies in 9 fathoms at low water with Wangeroog church tower S.W. ¾ S., and Wangeroog lighthouse S. by W. ½ W. 4¾ miles. A black can buoy lies in 6¾ fathoms at the outer extremity of the Rother sand, E. ¼ N. 2¾ miles from the Key buoy, and N.E. ¼ N. 6 miles from Wangeroog lighthouse; also a red nun with perch S.E. by E. ½ E. 2 miles from the Key, and S.W. ¼ S. 1½ miles from the last: between these two buoys is the new entrance to the Weser, or Neue Weser; both these buoys are lettered A.

Afterwards, the channel as far as the light-vessel is marked on the port hand by four white can buoys upon the Rothersand, which are numbered from 1 to 4, and a black can buoy lettered F on the south extremity of this sand; and on the starboard hand by five red nun buoys, lettered from B to F, upon the Jade flat and Rother grund; these latter buoys have also the following distinguishing marks:—A has a gilt spear, and lies as above-mentioned; B a round basket, C a gilt cross, D a round basket, E a cross, and the last buoy with a double F has two wings.

The Alte Weser or Old channel, which is little used now owing to the widening of the Norder grund, and the soundings being very irregular rendering the approaches difficult, Rother sand is marked by black buoys lettered from A to F on the starboard hand, and by white buoys numbered, on the port hand. The black buoy A just described lies at the junction of the entrances to the Old and New channels, at the outer extremity of the Rother sand; the black buoy F is on the south extremity of the same sand, at the inner junction of the two channels.

From the foregoing description it will be understood, that the new channel of the Weser, within the outer red and black buoys, has white buoys on the port hand and red buoys on the starboard hand for a distance of 6 miles, or near the light-vessel at the junction of the two entrance channels, when the general arrangement of black on the starboard hand and white on the port is continued up, lettered and numbered consecutively from the outside. On the Mellum flat north of the dry sands from the shore are two white buoys, marking a narrow channel at the north-west edge of the Mellum sand, joining the Weser and Jade.

Deviation of the Compass.—A red buoy has been laid down in a depth of 26 feet water in the road above Bremerhaven as a deviation buoy, with Imsum church steeple bearing from it N. 3° 59′ W. distant

5·5 miles; steeple of Bremerhaven church N. 37° 34′ E. distant 1·08 miles; steeple of Blexen, N. 63° 27′ W., distant 1·15 miles; Dedesdorf, S. 40° 14′ W.; Geestendorf, S. 81° 55′ E.; and Wulsdorf, S. 23° 25 E., distant 4,112 yards. Magnetic bearings, 1878.

Anchorage.—At 1½ miles eastward of the Hohe Weg lighthouse is a red buoy with a flag, which lies at the north end of Robben flat, at the point of divergence of the Dwasgat and Fedderwarder channels leading to Bremerhaven, and three-quarters of a mile to the north-east of it is a white buoy surmounted with a double-headed eagle. Below the former buoy, and abreast the lighthouse, is good anchorage in 8 fathoms. There is also anchorage in 26 feet water on the north extremity of Robben flat. No vessel should proceed higher up without a pilot.

Continuing from this roadstead towards Bremen, white buoys are on the port hand and black buoys on the starboard hand, as before mentioned.

Beacons.—On the port side of the entrance of Dwasgat (the eastern) channel are three prominent wooden beacons upon the Ever sand. And S.E. 2¼ miles farther, also on the same side, is Jungfern (Virgin) beacon, with ball and vane; in consequence of the extension of the northern bank of the Robben flat this beacon had to be removed to its present position, its old site S. ½ E. distant half a mile, is marked by a pole with a basket ball on the top. These beacons are delineated on the chart.

TIDES.—It is high water, full and change, at the Schlüssel buoy at the entrance of the Weser, at 11h. 30m.; at the Weser light-vessel at 0h. 20m.; at Hohe Weg lighthouse at 0h. 35m.; and at Bremerhaven, 1h. 40m.; springs rise 14 to 10½ feet.

DIRECTIONS for the WESER.—From the uncertainty of the light-vessels or buoys being in position, especially during the winter months, it is advisable for strangers to secure the services of a pilot before entering the river. To ships from the westward with westerly, or south-westerly winds, the best plan to pursue is to pass in succession the islands of East Friesland, page 190, in a depth of 10 or 11 fathoms, until the Weser light-vessel or Wangeroog church and lighthouse have been sighted; on this course will be seen successively, Terschelling, Schiermonnikoog, and Borkum fixed lights, the Borkum flat light, and the flash light at Norderney. When Wangeroog church bears S.W. ¼ S., and the lighthouse S. by W. ½ W. 5 miles, a vessel will be near the Schlüssel buoy at the mouth of the Weser: whereas, with north-westerly and northerly winds, it will be better to sight Helgoland, and to steer such a course with respect to the tide as will keep it bearing N. by E. ½ E. until the Weser light-vessel or Wangeroog lighthouse has been sighted; then keep the latter S. by W. ½ W., and on towards the Schlüssel (Key) buoy.

In approaching the mouth of the Weser from the northward, Wangeroog lighthouse must not be brought to the westward of S.S.W., nor Wangeroog church to the westward of S.W., so as to avoid the shoal water on the North flat.

In hazy weather while in the vicinity of the mouth of the Weser, do not go into a less depth than 13 fathoms, clay. If the weather is fine and the tide flood it may be advisable to anchor, but with the ebb keep under way, as it sets off shore.

From the Key buoy steer S.E. by E. ½ E., for 1¾ miles to the outer red buoy upon the Jade flat; then pass the other red buoys in a south-east direction, and when the light-vessel bears S.S.E. ½ E. steer into the main channel, where anchorage may be taken above the light-vessel in 9 fathoms at low water.

As the Rother grund is steep-to between the red buoys D and E, a vessel should carefully avoid getting on the line of these buoys; the same precaution is also necessary on the line of white buoy No. 4 and black buoy F, on account of a small patch with only 12 feet water on it.

The light-vessel may also be approached from the northward through the Alte Weser or old channel of the Weser, as it is marked by black and white buoys, but though it is constantly used by coasters, it is not a passage to be recommended to a stranger, for the land-marks being more distant, the vessel's position on entering cannot be so readily determined.

At night, the more prudent course will be to keep under way and maintain a proper position, which will be determined by bearings of Helgoland and Wangeroog lights. The Weser light-vessel, if in her place, is a good point of departure for the Schlüssel (Key) buoy which lies about S.E. ½ S., 3½ miles from her.

The Weser light-vessel kept on a N.W. ¾ W. bearing will lead up between the buoys, and when Wangeroog light bears W. by S., *Bremen* light-vessel should be brought to bear S.S.E. ½ E. and steered for.

To proceed above *Bremen* light-vessel, steer a general S.S.E. course, which will be nearly in the direction of the channel, with the white buoys on the port hand and the black buoys on the starboard hand; pass to the eastward of Hohe Weg lighthouse, and anchor abreast of it in 8 fathoms, and obtain a pilot.

As no vessel should navigate the upper portion of the Weser except under charge of a pilot, a further description of it is needless, beyond mentioning that the direction of the channel is S.E. by E. to S. by E.

A new channel, opposite to Wremen, leading from Fedderwarder channel to the Wurster channel, has been marked by black buoys on the starboard side and white buoys on the port side.

The channel up to Fedderwarder is buoyed, lettered and numbered in continuation from the main channel; from thence the shallow passage across the sands to Bremerhaven is marked by perches. The Dwasgat and Wurster channels above the Eagle buoy are lettered from a. on the starboard hand, and from No. 1 on the port, as far as the new cut opposite Wremen, where the Wurster channel divides into the Eastern cut along the land, and the Western along Lang Lütjen sand. There is anchorage near the Eversand beacons, well sheltered; also in the Wurster channel, which large vessels cannot pass through before half flood.

Life-boats.—A life-boat is stationed at Wremen, and one at Bremerhaven.

HELGOLAND (Holy land, Danish), at the head of the bight which it names, a common landfall, and point of departure to ships bound to the Elbe or Weser, and nearly equidistant from the mouths of the Weser, Elbe, and Eider, is a possession of Great Britain.

The island is nearly a mile long in a N.N.W. and S.S.E. direction, and a quarter of a mile broad, with a surface sloping to the north-eastward. It is a mass of red sandstone, presenting on all sides a perpendicular face to the sea, 165 feet high on the west side, and 120 feet on the east side, and its bold unmistakeable character renders it an invaluable sea-mark. Helgoland having been extensively wasted by the sea, is surrounded by broad rocky ledges, which project from its northern part nearly a mile N.N.W., and more than half a mile to the southward of the southern point. The town is at the south-east point of the island, partly upon the summit of the cliff and partly upon a low tongue at its foot. It consists of about 400 houses, containing a population of 2,500 persons, and is much resorted to during the summer months for sea bathing.*

LIGHT.—A white circular light-tower, 60 feet high, with attached residence, stands upon the summit of Helgoland, a quarter of a mile from its south end, and a short distance from the old lighthouse. It exhibits at an elevation of 225 feet above high water, a *fixed* white light visible in every direction at a distance of 20 miles in clear weather.

On the steps midway between the lower and upper towns, is a *fixed red* light for the use of fishermen.

Fog signal.—The fog signal station is on the summit of the island at its north-west end, and is 165 feet above high water. During foggy weather a report similar to that of a gun will be produced by gun cotton *every* 15 *minutes.* The station bears N.W. by N. from, and is half a mile distant from the lighthouse.

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* *See* Admiralty plan of Helgoland, with Views, No. 126; scale, $m = 6$ inches; chart of Elbe river, &c., No. 1,875; scale, $m = 0 \cdot 5$ of an inch; and chart of Eider river, No. 1,887; scale, $m = 0 \cdot 5$ of an inch.

[illegible] water

[illegible] half a mile, [illegible]

[illegible] upwards [illegible]

[illegible] one mile from

[illegible] a cluster of

[illegible] the southward of

[illegible]

[illegible] beacons, with stay

[illegible] north-west, 34 feet, an

[illegible] anchorages, the Nort

lies in 7 fathoms water outside the small round reef Druuck, with the lighthouse bearing S.S.E., distant 2 miles.

Loreley Bank.—This shoal has been recently discovered. It lies East of Helgoland, and has upon its shoalest part about 3¾ fathoms, whence to the southward the water deepens abruptly, but on the north side there is a depth of 4 and 5 fathoms for a distance of a mile. The shoalest part bears E. by S. ¼ S., 3¾ miles from the lighthouse on Helgoland, and the direction of the bank is N.N.E.

ANCHORAGE.—A sandy ridge with 2 to 2½ fathoms upon it at low water connects Helgoland with Sandy island and its ledges, and divides the space between them into two portions, named the North and South havens. From the limited extent of Helgoland, and the small protection it affords in gales from the westward, the havens are at best but imperfect anchorages, while gales from N.N.W. blow directly through them. Of the two, however, the South haven is the more exposed and contracted in space.

The North haven is a mile long, and a third of a mile wide, with 3½ to 4 fathoms in it over a bottom of sand. The anchoring marks are, the lighthouse and church in line S.W. ½ S., and the middle beacon on Sandy island a little open to the southward of the north-west beacon; and in the South haven, with the lighthouse N.W. by W. ½ W., and Sandy island middle beacon open a little to the northward of the south-west beacon N.E. by E. ½ E., in 3 fathoms at low water.

For vessels of large draught better anchorage will be found 1¼ miles to the eastward of Sandy island, in 8 or 9 fathoms, fine sand, with Helgoland lighthouse bearing West. This anchorage has the advantage of being readily quitted in case of parting, or other emergency.

TIDES.—At Helgoland it is high water, full and change at 11h. 33m.; springs rise 9½ feet, and neaps 7½ feet; neaps range 5¼ feet.

DIRECTIONS.—If approaching Helgoland from the westward, and intending to enter the South haven, steer so as to pass at least a mile to the southward of the main island, and when Sandy island middle beacon has been brought a little open to the northward of the south-west beacon, bearing N.E., keep them so until the old lighthouse appears open to the eastward of Bull beacon; the Steen rock will have then been passed, and a N.E. by N. ½ N. course must be steered for the anchorage. If closing the island from south eastward, keep the old lighthouse open to the eastward of Bull beacon N.N.W., leaving the Steen buoy on the port hand, until Sandy island middle and south-west beacons have been brought in line, N.E. ½ N., when a N.E. by N. ½ N. course should be steered for the anchorage as before.

To enter the North haven, steer from the westward so as to pass 1½ miles to the northward of Helgoland, and when Sandy island middle and north-west beacons have been brought in line, S.E. ¼ S., proceed with them so, and they will lead between the foul ground from the north-west point of the island, and the rocky ledges extending from Sandy island; continue with the beacons in line, until the lighthouse appears nearly on with the church, and anchor a short distance to the southward in the position already indicated.

By night.—To arrive at this anchorage at night, (an operation which to a stranger would be attended with risk,) it is usual to round the north-west end of Helgoland, by keeping the light in sight above the cliff, and when the north-west point of the island bears S.S.E., which shows that the outer ledges from it have been cleared, steer a more southerly course for the anchorage, from which the light bears S.W. ½ S.

CAUTION.—No greater depth than 15 feet at low water should be reckoned upon in either of the passages by the Steen rock, therefore, in the event of a swell, the tide should be well flowed before attempting to use them.

THE ELBE, one of the largest rivers of northern Europe, and the highway of a most extensive trade, rises between Silesia and Bohemia, at a height of 4,440 feet above the level of the sea; it intersects Saxony, a considerable portion of Prussia, part of Hanover, and divides the latter from Holstein. In direct distance the Elbe is 395 miles long, but including windings the length of the river is upwards of 780 miles. It receives the waters of the Iser, Schwarz, Elster, Havel, Alder, Maldau, and Eger; after its junction with the latter river it becomes navigable; and entering Saxony, it passes successively Dresden, Meissen, Torsau, Wittenburg, and Hamburg. In its course, which is northerly, it receives the Mulda and Saalite, and running through the territory of Magdeburgh and the duchies of Mecklenburgh and Lamburg, it discharges itself into the German Ocean at the head of Helgoland bight, S.E., 20 miles from the island, and about 15 miles to the eastward of the Weser, the intermediate space is filled with sand banks, extending 15 miles off shore, which are partly dry at low-water, and intersected with channels used by the small craft of the country in passing from one river to the other. Its mean depth is 10 feet, and its average width 900 feet; but it widens at some parts to upwards of 1,000 feet, and at its mouth to between 5 and 6 miles. Numerous steamboats now traverse the Elbe, and communicate between Hamburg and London and the eastern ports of England; with Havre and Bordeaux in France; Havannah, New Orleans, New York, &c.*

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* *See* Admiralty chart: Elbe river, with entrances of Jade, Weser, and Eider, No. 1875; scale, *m* = 0·5 inches.

Note.—The Elbe is liable during the winter months to silt up to the extent of 10 or 12 feet in places, causing alterations in the channels. A new channel has recently formed immediately above Elsfleth along the west side of Pagen sand, having 3 feet more water in it than in the old channel. This channel is buoyed.

HAMBURG, the most important of the free ports of Germany, is the commercial emporium of the Empire, and the greatest mercantile port on the continent of Europe; it is on the right bank of the Elbe, about 70 miles from its mouth. Its shape is nearly that of a semicircle, the diameter being formed by the Elbe, while the curve is marked by the river Alster. Hamburgh was surrounded by strong walls, but these, and all the fortifications connected with them, have been levelled, and the space which they occupied converted into spacious roads and gardens.

In 1842 the town was visited by a dreadful fire, destroying 61 streets, with 1,749 houses, but in repairing the damage, streets have arisen of which any city in Europe might be proud. The principal buildings are the church of St. Nicholas, a noble gothic structure, with a lofty tower and spire; St. Peter's church; St. Michael's church, with a spire 456 feet high, and consequently one of the loftiest in Europe; St. Cothenues, with a spire 390 feet high; the Exchange, a noble edifice, besides numerous other structures devoted to literature, science, and art. In 1853 the population of Hamburg and its suburbs amounted to 161,390, and in 1871 to 240,251; the population of the State in 1875 was 385,859.

Hamburg is the principal German emigration port; 42,224 emigrants embarked for America in the year 1871.

Hamburg does not depend much on manufactures; it produces, however, linen, cotton, and silk goods, soap, tobacco, refined sugar, iron, tin, and copper ware, &c. The trade is very extensive, including, to a greater or less extent, every article which Germany is able to sell, or requires to buy, and is greatly facilitated by means of communication both with foreign countries and with the interior. By the Elbe, vessels drawing 18 feet can ascend at high water, and either deliver their cargoes directly into the warehouses which line the banks, or send them by lighters into the heart of the town. A great drawback to the trade is the want of a sufficient harbour, the vessels being obliged to lie in the river, within a space railed off from the fair-way, and protected from the current by means of piles. Vessels drawing not more than 15 or 16 feet water can lie afloat at the wharves or in the river during ordinary tides; but those of greater draft ground in soft mud at about half tide. The imports consist of sugar, coffee, tea, rice, tobacco, cotton, indigo, dye-woods, wines, spirits, spices, coals, British manufactured goods, &c.; and the exports, of grain, seeds, butter, wool, salt provisions, cattle, German manufactures of all kinds, Rhenish wines, &c. The commerce with Great Britain is very large.

In 1872 there belonged to the port 406 vessels, of 230,637 tons, and in the same year there entered with cargoes or in ballast 5,439 vessels of 2,516,673 tons; and there cleared with cargoes or in ballast 5,450 vessels, of 2,230,940 tons. In 1876 the total value of the imports was

90,279,000*l*. Its canals, &c., give it free and uninterrupted communication with the Baltic, by the basin of the Oder; and through North Germany by the Vistula into Poland, &c.

Railways connect Hamburg with Rendsburg and Kiel, Schwerin, and Rostock, and with Berlin, and all East and South Germany.

Hamburg has two dry docks, one belonging to the Hamburgh American Steamship Co., 375 feet long, 60 feet wide at the entrance, where their vessels drawing from 16 to 17 feet water can be docked at ordinary tides; the outer dock is 250 feet long, 50 feet wide at the entrance, and can receive vessels of 12 feet draft at high water ordinary tides. It has six patent slips, two of them capable of taking up ships of 1,200 tons register, two for ships of 500 tons, and two for smaller vessels. There are six building yards, in three of them ships up to 1,000 tons register are built; there is also the Reiherstug iron ship and engine building yard, where sailing and steam vessels of 1,800 tons register have been built. On the banks of the river, in the vicinity of and below Hamburg, there are six or seven other yards where vessels of moderate size and small craft are built and can be repaired.

Time ball.—A time ball has been established on the tower of a storehouse on the Kaiser quay. Ten minutes before the time signal a black ball will be hoisted half way up, and at three minutes before the time it will be hoisted to its full height. The ball will fall every day at 0h. 0m. 0s., Greenwich time, or 0h. 39m. 53·7s. mean time of the Hamburg observatory. If the time ball should not fall at the appointed time, a red ball will be hoisted as far up as the upper edge of the structure within 5 minutes of the failure of the signal, and remains up for 5 minutes.

CUXHAVEN, a seaport of Germany, is situated on the south point of the entrance to the Elbe; near it stands the lighthouse. Vessels wait for favourable winds in the road, where there is good anchorage abreast the town, and when going up the Elbe they call here for pilots. In winter, when the river is frozen, passengers embark and land at Cuxhaven. Packets call regularly bound for London and the chief English ports, Havre, and Rotterdam. Population 1,200; the men are mostly fishermen and pilots.

It is a free port, with no harbour dues; the harbour has been deepened so as to admit vessels of 18 feet draft at ordinary tides, and is much frequented as a harbour of refuge, having means to repair damage.

Telegraph station.—A telegraph connects the port with Glückstadt, Altona, and Hamburg.

Quarantine.—Cuxhaven is the quarantine station for vessels bound up the Elbe.

Time ball.—The time ball is near the lighthouse; the ball falls at noon mean time of place; and again at 34m. 50s. later (noon at Greenwich).

CHANNELS into the Elbe.*—The northernmost passage into the Elbe, named the North Elbe, having silted up is no longer navigable. The main entrance, or Nordergat, lies between the Great Vogel sand on the north, and the Scharhörn reef and Little Vogel sand on the south. Within the entrance is the Suder (South) gat, between the Little Vogel sand on the north-east and Scharhörn sand to the south-west; this channel has silted up, and had only 8 feet water in its southern part in 1875. The Norder and Suder gats again unite about 10 miles within the outer light-vessel; and the main channel for the remaining 6 miles to Cuxhaven is between the Gelb sand and the Medem to the north-eastward, and the Steil (steep) sand to the south-westward.

Buoys.—The principal entrance to the Elbe is marked by a large red, and black can buoys on the starboard hand entering, and by white nun buoys with vanes on the port hand. Above, where the channel divides, the northern or main branch has black and red buoys on the starboard hand, along the edge of the Little Vogel sand, and red and white on the port. The Suder gat, which is only partially buoyed, is bounded by black can buoys on the starboard side; within the junction with the main passage, and off the northern edge of the Steile sand, is a small red buoy, afterwards, towards Cuxhaven and up the river to Hamburgh, black buoys mark the starboard side of the channel, and white buoys the port side; the black buoys are lettered, and the white buoys numbered consecutively from outside.

LIGHT-VESSELS.—There are four light-vessels at the mouth of the Elbe; each vessel has three masts, and is painted red, with *Elbe* in white letters on the sides.†

The Outer light-vessel lies in 12 fathoms, at the entrance of the Elbe, with Neuwerk high lighthouse and Scharhörn beacon nearly in line S.E. by S.; she carries, when in position, a *red* flag at the main by day, and during the night shows a *flash* light *every* 20 *seconds*, which is 38 feet above the water, and visible 12 miles. In foggy weather, a bell is sounded every quarter of an hour for *one minute*. In rain and snow a gun is occasionally fired. This vessel generally leaves her moorings in January or February.

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* The description of the channels at the mouth of the Elbe, and the directions for entering them, are partly from the authority of *Commander* Abendroth, captain of the port, corrected by the latest charts to the present date, 1877.

† The light-vessel of the Weser has two masts, and carries a ball at one mast head. The outer light-vessel of the Eider has three masts, and carries a ball at each mast head.

The Middle or No. 2 light-vessel, lies in 12 fathoms water, in mid-channel off the outer end of the spit of the Little Vogel sand, and S.E. by E. ¼ E., about 4¼ miles from the Outer light-vessel; by day she flies a flag, blue and white horizontally, at the fore, and by night shows two *fixed white* lights *vertically* on the same mast, at the heights of 22 and 38 feet, which are visible 6 and 8 miles; a bell sounds during fogs. This vessel when possible remains during the year.

The Inner or No. 3 light-vessel (*Jacob Henrich*) lies in mid-channel of the North or main channel, S.E. ½ E., 4½ miles from the Middle light-vessel. By day, she carries at the main a red flag with a white square in it, and at night shows a *fixed* white light at 36 feet above the sea, and visible for 8 miles; from her, Neuwerk high lighthouse bears S.W. ¼ W., 2¾ miles, and Kugel beacon S.E. ¾ S. 6¼ miles.

No. 4 light-vessel (*Ernst*)* is moored near mid channel in 10 fathoms below the Ball (Kugel) beacon, S.E. by E. from the Inner light vessel, N. ¾ W. from abreast Cuxhaven, and may be passed on either side. The vessel is distinguished during the day by a black wicker ball at the main-mast head, and exhibits at night a *fixed* white light, elevated 25 feet above the sea, and visible in clear weather for 6 miles.

In foggy weather a bell is rung for *one minute* at intervals of a *quarter of an hour.*

When the Middle and Inner light-vessels are under repair, their position is taken up by a vessel with two masts. The distinguishing flags are borne only while the vessels are in their proper stations; and by night in addition to their masthead lights, they exhibit a white riding light forward, at a height of 6 feet above the rail. If in the daytime a vessel, which by the colour and rigging is evidently a light-vessel, has no flag flying, she is not in her station, and special caution is then necessary. If vessels get out of the channel, the light-vessels are instructed to attract their attention by firing guns, and at night by burning blue-lights, &c.

CAUTION.—During the prevalence of ice reliance cannot be placed on the light-vessels maintaining their stations, or on the positions of the buoys in the North channel: the Elbe should therefore not be entered at such times, except with southerly or westerly winds, because by them alone is the drift ice kept from the south shore and the harbour of Cuxhaven; the latter is never clear of ice when it exists in the Elbe except with these winds.

When the Outer and Middle light-vessels and Pilot galliot put to sea on account of the ice, directly the wind turns westerly and removes the ice, they resume their stations, and generally before any vessels bound to the Elbe can have arrived.

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* February 1878.

LIGHTS.—Upon the island of Neuwerk, which lies on the southern side of the river, and 5 miles from the main land of Hanover, are two lighthouses, each showing a *fixed* white light at the respective heights of 126 and 60 feet above high water, and visible 15 and 10 miles in clear weather; the high lighthouse is square, with the upper part black and the lower brick colour; the lower lighthouse is octagonal and black; they bear from each other S.S.E. and N.N.W., and are 685 yards apart. Upon the eastern face of the lower lighthouse, and 25 feet below the low light, is a light shaded so as to show within an angle of 12 degrees that it is visible between the buoys No. 8 white and J black.

Kugel light, on Kugel point, 1½ miles northward or below Cuxhaven, is a *fixed* white light, shown on a small house, 40 feet above the sea, and visible for 8 miles only from buoy J to buoy L; the latter, which has a mast with four balls, being nearer the beacon.

Cuxhaven.—At the west side of the entrance a white light is shown from a circular brick tower at an elevation of 80 feet above high water, and visible 12 miles. While approaching it from the lower part of the river below black buoy L, it appears as a *flashing* light showing a flash *every minute*, but as a *fixed* light above the direction of this buoy. From the same tower is exhibited a *fixed* light at an elevation of 30 feet above the sea, and visible for 8 miles, showing only between buoys L and No. 11.

On the west pier from a round white turret at the height of 30 feet above the sea, is shown a *fixed red* and white light, which can be seen for 3 miles. The white light seen, indicates the entrance of the harbour.

The following lighthouses and light-vessels at present mark the channel of the Elbe between Cuxhaven and Hamburg:—

At Altenbruch 3 miles above Cuxhaven is exhibited from a beacon, at an elevation of 43 feet, a *fixed* white light visible for 8 miles, which illuminates the upper channel as far as black buoys LL., M., N. and O., and the lower from Groden beacon and the Alten Liebe at Cuxhaven.

At Brunsbüttel on the north side of the river, from a beacon, a *fixed* white light is shown at 43 feet above high water, and visible for 8 miles. This light illuminates the whole breadth of the channel of the river upwards, and the lower channel as far as the white buoys, Nos. 19, 18 and 17.

At Bösch, upon the right bank of the river, 19 miles above Cuxhaven is exhibited a *fixed* white light on the pilot house, at 16 feet above the sea, and visible for 4 miles. It is lighted when the river is free of ice.

Storen, at the entrance of the river Stor, 2½ miles below Glückstadt, shows a *fixed* white light, from a circular transferable tower on the north pier, elevated 22 feet and visible for 5 miles.

Glückstadt, upon the north pier, a *fixed* white light; with a *red* sector between N.E. by E., and E. by N. ½ N. The lighthouse is an iron tower 27 feet in height and painted white; the white light can be seen 10 miles, and the red 6 miles.

Elsfleth, on the stone dam near Collmar, from a post 30 feet high a *fixed* white light is shown. The light is visible for a distance of 3 miles up the Elbe between the black buoy No. 18 and the white buoy No. 13, over the whole width of the channel.

Kraut light-vessel, 4 miles above Glückstadt, is painted red with her name on her sides, she carries a ball at the mast head, and a *fixed* white light elevated 40 feet above the sea, which is visible 5 miles. During foggy weather a gong is sounded. Vessels must pass northward of the light-vessel.

Pagensand light tower is square and painted white, on the north side of the sand. A *fixed* light is exhibited from it at 35 above the sea, which can be seen for 5 miles, and illuminates the new Pagen sand channel in its whole width up to Elsfleth Steindeich. The light is *red* between black buoy No. 15/16 and Kraut light-vessel, in other parts of the channel it is white.

A second *fixed* white light is shown from the same tower at about 19 feet below, to light the narrow channel between the two white buoys Nos. 13 and 13/14 and the black buoy No. 17.

Juel lighthouse, a square white tower on the north-west point of Juel sand, exhibits at 30 feet above the sea, a *fixed* white light visible 6 miles.

Lühe light, 12 miles below Hamburg, and at the west entrance of Lühe river, is a *fixed* white and *red* light from a white turret 40 feet high, and visible 5 miles. The *red* sector of light is in the direction of white buoys Nos. 3 and 4.

Schulau light-vessel, 1½ miles above the Lühe, and near the west end of Hanskalb sand, and in 3 fathoms at low water, shows a *fixed* white light visible for 5 miles; she carries a ball at the mast head. A gong is sounded in foggy weather. Pass north of her.

Schulau shore light is shown from a white beacon 200 yards north-west of the port; elevated 42 feet, and visible 5 miles. The light is *fixed* and white except a *red* sector between white buoy No. 2 and black buoy No. 8.

Finkenwärder light is a *fixed red* light shown from a beacon 3 miles below Hamburg, and illuminates up the river the whole breadth of the channel to the Mühlenfluth sand.

Hamburg.—A *fixed* light is exhibited from the west corner of Sandthor quay. The light shows *red* in the direction of Ostergatt, and *green* towards Sandthor harbour.

Beacons.*—The principal beacons used for the navigation of the Elbe to Cuxhaven are the following:—Scharhörn is 96 feet high, and has a chamber of refuge for shipwrecked men, on the sands N.W. ¾ N., 3¾ miles from Neuwerk high lighthouse; North Beacon 69 feet in height, N. by W. ¾ W., half a mile from the low lighthouse on line with the higher one; and East beacon on the north-east side of Neuwerk island, N.E. by E. three-quarters of a mile from the high lighthouse; Ball beacon stands on a projection about a quarter of a mile East of Kugel point lighthouse; and on the shore near Duhnen about 2 miles West of the latter is another; and also on the two points south-eastward of Cuxhaven, Groden beacon the farthest, is nearly 2 miles from Cuxhaven, and 75 feet high.

PILOT GALLIOT.—The sea pilots for conducting vessels into the Elbe are on board a galliot, which in fine weather, lies in 10 or 12 fathoms, E.S.E. 1½ miles from the Outer light-vessel, and E. ½ N. one mile from the red buoy; and, in bad weather, E. by S. ½ S., one mile from the Middle light-vessel.

The pilot galliot has two masts, and carries a vane 3 fathoms long at the main-mast, and the Hamburg Admiralty flag at the mizen-mast so long as she can supply pilots. At night, when at her outer station, she shows a light to ships coming in; but when she is at her inner station, inside the second light-vessel, she exhibits a light half-mast high throughout the night.

Pilots board vessels coming in according to circumstances, either in a sailing boat with the Hamburg flag flying, or in a rowing boat having the Hamburg arms on its bows.

The pilot flag should be shown at the fore by day, and a light by night when approaching the pilot galliot, see pilotage signals page 186, and the vessel be hove to as near her as practicable to enable the boat to board conveniently.

Pilots can also be procured at the stations at Bosch and Schulau light-vessel.†

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* On the Gelb sand below Cuxhaven, two post beacons 756 yards apart, and 16 feet high with basket work on the top have been erected to mark the fortification works which are being carried on there. On the Steil sand at about half way between Stickersgat and Eitzenloch, two post beacons 220 yards apart have been erected, similar to those on the Gelb sand and for the same purpose.—July 1875.

† Independent of the Pilot galliots, Hamburg maintains two schooners to cruise between the mouth of the Elbe, Borkum, and Helgoland to furnish pilots to vessels bound to the Elbe. They are named *Cuxhaven* and *Elbe*, and carry a broad pendant and the Hamburg flag at the main, and have their numbers 1 and 2 on the foresail; by night they show a *red* light. The pilots take vessels as far up the Elbe as Bosch, where the river pilots take charge.

TIDES.—It is high water, full and change, at the mouth of the Elbe at 0h., and springs rise 11 feet; at Cuxhaven at 1h. 8m., springs rise 10 feet; at Brunsbüttel at 1h. 58., springs rise 9 feet; at Glückstadt at 3h. 9m., springs rise 11¼ feet; at Altona at 5h. 9m., springs rise 8 feet; and at Hamburg at 5h. 29m., and springs rise 7½ feet. Under ordinary circumstances of weather the flood tide reaches as far as Hamburg, but when there is much water in the river it is not felt beyond Schulau or Blankenesse.

In westerly winds, the first two hours of the flood sets north-east across the mouth of the Elbe, and the set for the first two hours after high water is south-west.

At the red buoy the ebb first sets south-west, then west, north-west, and lastly north; the flood gradually veers from north-east to east, and south-east directly into the channel.

The direction of the tide-streams about the entrance of the Elbe are considerably influenced by strong winds; and hardly anywhere in the river does the stream come to a stand, but merely changes its direction, and that often to every point of the compass. Between Cuxhaven and the mouth of the river, the stream runs stronger than in the offing, attaining at half ebb a rate of 3 to 4 knots an hour, and at half flood 2 to 3 knots, according to the age of the moon. At Cuxhaven the ebb commences one hour later than at the red buoy; the tide ebbs for 6h. 45m., and flows for 5h. 40m.

CAUTION.—Near the mouth of the Elbe the flood sets north-easterly, and the ebb south-westerly, but near the entrances of the Jade and Weser the flood sets south-easterly into those rivers. See caution, page 217.

Buoy.—Wester till buoy near the northern edge of the Norder Grund is moored in 13 fathoms water, at about 7½ miles to the westward of the Elbe outer light-vessel. It is a large conical buoy with a mast and three balls, and in clear weather can be seen 8 miles. The buoy is liable to break adrift in gales of wind.

DIRECTIONS.—In westerly and south-westerly winds it is advisable, after having sounded upon and identified Borkum flat, page 184, to steer easterly along shore until midway between Helgoland and Wangeroog, when the outer light-vessel and the red buoy at the mouth of the Elbe will bear about E.S.E. 15 or 16 miles; make this course good by due allowance for tide set, and sound continually. In this track, the depths will be found to decrease from 17 to 12 fathoms over bluish clay, to near the light-vessel; but should the vessel get into 9 or 10 fathoms, sand, she will then be too far to the southward, and must at once be kept away northerly to regain the former soundings.

The quality of the bottom between the tail of the Vogelsand and the Scharhörn (page 209) is variable; along the edge of the latter is a bed of clay; there is also similar clay to the northward, intermixed with mud, sand, and broken shells; and, if the vessel be going rapidly through the water, the same ground will seldom be obtained by two consecutive casts.

When the first or Outer light-vessel has been sighted, keep her well to the southward of East, so as to avoid the south shore, sounding continually until the mouth of the Elbe and the objects marking it have been clearly identified.

A common plan of proceeding, to those well acquainted with the Elbe, is to steer well to the southward from Helgoland and get into 12 fathoms water, dark blue clay, which depth will lead to the Outer light-vessel. In thick or hazy weather the Wester till beacon buoy, just described, serves as an excellent guide to prevent the passages in its vicinity being mistaken for the river Elbe.

Do not approach the Norder grund nor the Scharhörn sand nearer than 9 or 10 fathoms depth, the latter is very steep; in bad weather the sea breaks on the edge of this sand which renders it easy to recognize. The Vogelsand is steep between Nos. 2 and 3 buoys; there are 13 fathoms near buoy No. 3; and be careful not to get on the line of bearing between the red and white buoys Nos. I. and II., so as to avoid the 16 feet patch.

In north-west winds, make Helgoland; take a departure from it and shape a course for the Elbe. From Helgoland lighthouse, the Outer light-vessel of the Elbe, and the red buoy, bear S.E. ¾ S., at the respective distances of 18 and 19 miles, and to make that course good, it will be necessary to steer from Helgoland S.S.E. with the young flood, S.E. by S. at half-flood, and S.E. during the ebb tide. The depths decrease from 20 to 12 fathoms over bluish clay, then to 9 or 10 fathoms sandy mud, and then they will increase to 12 and 12½ fathoms, coarse yellow sand with broken shells, to near the light-vessel—if the weather is foggy probably the guns of the light-vessel will be heard. To the northward of this track is a sandy bottom of a reddish colour, with 7 to 9 fathoms water. Should the Outer light-vessel be first seen to the southward of S.E. by S., at a distance of 6 miles, there will be a depth of 9 or 10 fathoms, fine dark sand (the outer tail of the Vogelsand), but with the light-vessel bearing S.E. or S.E. by E. at the same distance, the depth will be 11 to 13 fathoms over slimy bluish ground sometimes mixed with broken shells.

At Night.—In favourable clear weather Neuwerk high light will be first seen at a distance of 8 miles outside the red buoy, and while Helgoland light is fully in view. Having sighted Neuwerk lights, bearing S. by E. ½ E., or S.S.E., from a position to the northward of the tail of the Vogelsand, steer to the southward keeping the high light open to the

southward of the low one, and when the water deepens from 6 and 8 fathoms, while crossing the tail of the Vogelsand, to 10 or 12 fathoms, the mouth of the Elbe will have been reached; the Outer or Middle light-vessels will be seen, and the course may be regulated accordingly.

As the high light at Neuwerk was often mistaken for that of the first or Outer light-vessel, an error which at times resulted in loss, the fixed light of the latter was changed to a revolving one, and the mouth of the Elbe may be thus approached without risk, even should the Outer light-vessel not be in her station; for the appearance or otherwise of the lower light of Neuwerk will remove all uncertainty as to the identity of the lights in view.

CAUTION.—In the summer season it is advisable to enter the Elbe either early in the morning or in the afternoon, so as to avoid the beamy light of mid-day; but, though the day should generally be preferred for entering the river, there are exceptions to the rule, especially in the height of summer, when the fresh and clear nights are more favourable for sighting distant objects, owing to freedom from the glare of the sun and the exhalations from the sea.

Vessels getting on the Vogelsand in west or north-west winds are commonly lost, with their crews; whereas, if stranded upon the Scharhörn, the men have a chance of reaching the life-beacon, and are not unfrequently thus rescued.

In every direction seaward of the mouth of the Elbe there is good anchoring ground, and many a vessel but scantily provided, has, by anchoring and cutting away the masts, ridden out a heavy north-west gale when others running for the Elbe have been lost.

The best time of tide for entering the Elbe is about one-third flood when the stream runs directly in, but in heavy westerly winds the time of an hour before high water is to be preferred, for then, on account of the rise of tide, vessels of ordinary draught may, if they happen to diverge from the proper track, pass over several of the shoals without touching, and should they eventually touch the ground they are not long exposed to a heavy surging sea, and there is consequently less risk to life and property.

A N.N.W. gale and an ebb tide combined cause the most dangerous sea at the mouth of the Elbe, and heavy riding abreast Cuxhaven.

DIRECTIONS from the MOUTH of the ELBE to CUXHAVEN.—Pass to the northward of the Outer light-vessel, and steer E.S.E. to find the Pilot galliot; should she not be at her outer station, then steer S.E. by E. ¼ E. for the Middle light-vessel, which may be passed on either side; keep her bearing W. by N. ½ N., and the Pilot galliot will be found about a mile above her. If the galliot cannot supply a pilot, strangers will do well under all circumstances to anchor, and obtain one as soon as possible. But in case of proceeding on without a pilot, the light vessels and buoys will guide.

The Norder gat or North channel into the Elbe is the only practicable channel for large vessels, it is buoyed, and now very generally used by the pilots; and steam vessels go in and out through it by night as well as day. This channel is nearly straight, but the tides run strong, page 214.

To pass through the Norder gat, having proceeded as before directed, steer a S.E. by E. course towards the Middle light-vessel; pass just to the northward of her, and then S.E. ½ E. to the Inner light-vessel, passing on either side of her; then keep the black buoys and the black floating beacon which marks the north end of the sand bank between Kugel beacon and buoy K on the starboard side, and the white buoys on the port side, until near black buoy L, which is surmounted by 4 balls, pass to the northward of this buoy between it and white buoy No. 10, and then steer for the anchorage in Cuxhaven road; or, if No. 4 light-vessel is in position, steer about S.E. by E. from No. 3 or Inner light-vessel direct for her, and from No. 4 light-vessel steer direct to the roadstead, passing the buoys as previously directed. The lead should be attended to.

By Night.—Having as already directed, followed the line of light-vessels as far as the Inner or No. 3 light-vessel, pass just to the northward of her, and if No. 4 light-vessel is not in position, bring No. 3 light in line with that of No. 2 N.W. ½ W. and steer S.E. ½ E., which will lead between the buoys until Kugel point light and the high flash light at Cuxhaven are in line bearing S.S.E., continue the same course taking care not to shoal the water on the edge of the Steil sand to less than 4 or 6 fathoms and keeping Kugel light on the starboard bow until it is hid and Cuxhaven low light is seen, when the high light changes to a fixed light which is the signal for being above black buoy L and past the bend of the Steil sand which extends northward from Kugel beacon, a course may then be shaped, keeping the low light in sight, towards Cuxhaven road. Above Kugel beacon the south shore is shallow.

The Suder gat having silted up, and several of the buoys being removed, is only fit for small vessels, and should not be attempted by strangers without a pilot.

Above Cuxhaven, the direction of the Elbe to Glückstadt is about East and S.S.E., 28 miles; from Glückstadt to Stade S. by E., 10 miles; and from Stade to Hamburg S.E. by E. and E.S.E., 18 miles.

Deviation of the Compass.—Opposite Brunshausen about 17 miles below Hamburg are five black iron buoys; the centre and largest one for securing the vessel to, is in the shape of a pear, and lies in 4 fathoms at low water. From it the *true* bearings and distances of the following objects are:—Haselau church, N. 60° 56′ E., 3½ miles; Wedel, S. 62° 38′ E., 6¼ miles; Steinkirchen church, S. 29° 25′ E., a little over 5 miles; Hollern church, S. 15° 30′ E., 2¾ miles; Stade church, S. 48° 26′ W., 3 miles; Bützfleter church, N. 59° 50′ W., nearly 2½ miles; and Schwarz Tonnen sand beacon, N. 26° 17′ W., nearly 4¾ miles. For determining the deviation, the three most distant places are the best when the weather will permit their being seen. The variation in 1878 is 13° 54′ W., decreasing 8′ annually.

Life Boats.—A life boat is stationed at No. 2 light vessel, at Neuwerk, at Kugel beacon, and Cuxhaven.

NORDER ELBE.—The wide opening between the north side of the Great Vogelsand, and the flat of Boschsand Polln, is divided into two branches; the northernmost, called the Falsche Tiefe (False deep), skirts the north sides of the Trindel and Gelbsand, and as it shoals to dry between the Norder Gründe and Marner sand, it is, therefore, dangerous to vessels, which in thick and unsettled weather mistake this inlet for the Norder Elbe.

The southern branch, called the Norder or North Elbe, was important to navigation, but having now silted up it is no longer navigable. The Neufahrwasser is a narrow passage, leading from the False deep, and used only by coasters.

Buoys.—False deep for 7 miles in a south-easterly direction from the Outer buoy, is marked as follows:—A black direction buoy with a staff, at the south side of the entrance, bearing W. ½ S., and distant 3½ miles from Bosch sand safety beacon, and four black bottle-shaped buoys numbered from I. to IV., on the south side of the deep along the edge of the Gelb sand; with four white buoys lettered from A. to C. along the edge of the Bosch sand, on the north side of the deep. The farther extent of False deep towards Klotzen loch which leads into the Elbe, is marked by broom beacons.

CHAPTER VIII.

ELBE RIVER TO THE HORN REEFS.

VARIATION 14° 27′ West in 1878.
Decreasing about 9′ annually.

ASPECT of COAST.*—The greatest portion of the coast between the Elbe and Horn reefs consists of low marshy ground, enclosed by dikes, and outside sheltered by a range of islands and sand-banks, and surrounded by extensive shallow flats, which partly dry at low water, leaving narrow but deep-water channels between them. Such is the character of this part of the coast; and therefore a knowledge of the tides is of the utmost importance to its navigation.

The western side of all the islands, as also the coast of Eiderstedt in Slesvig, consists of sand-downs, and on the whole extent of this coast there are but few objects sufficiently high to be visible from a vessel outside the channels, except the beacons, placed in some of the inlets, and to which the strictest attention should be paid in steering for them.

PILOTS.—No branch pilots are established on this coast, except those at the mouth of the Eider, who are compelled to take vessels to the Hever also; but it is usual for fishermen from Fanö island to take charge of vessels bound to all places in its vicinity, and they attend when the proper signal is made off Graa deep.

Buoys and Beacons.—To avoid repetition, we may state that the following arrangements have been adopted on this part of the coast:—

The outer buoy is in general of a different colour in each of the various inlets where buoys are placed. The black buoys and floating beacons which carry brooms, are, in entering, to be left on the starboard side, and the white buoys and floating beacons, carrying baskets, on the port side. The same rule applies to the large beacons, known as steeple-beacons, standing in channels between the flats.

The small beacons or poles standing in the Vats (channels navigable only at high water) are placed on the west side, and, accordingly, are to be left on the port side when coming from the southward, and to starboard when coming from the northward, if not otherwise directed. The first and the last of these beacons carry two horizontal brooms, to distinguish them from the rest.

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* *See* Admiralty charts, North sea, No. 2,182*a*; scale, $m = 0\cdot1$ of an inch; Eider river to Blaavand point, No. 1,887; scale, $m = 0\cdot52$ of an inch; Elbe river entrance, with the entrances of Jade, Weser, and Eider rivers, No. 1,875; scale, $m = 0\cdot5$ of an inch; and Baltic sea, No. 2,842*a*; scale, $m = 0\cdot1$ of an inch.

The buoys are placed on the first of March, and removed on the 15th of November, unless compelled to deviate from this rule by ice or stormy weather. Where buoys are kept out during the winter, they are marked with brooms or baskets, like the floating beacons, to point out the different sides of the channels.

TIDES.[*]—The rise of the tide increases on going to the southward, from the Horn reefs to the bight of Helgoland; in the offing the time of high water full and change is at 12 o'clock.

Outside the islands, as well as between them, the tide flows and ebbs every 6½ hours; but frequent irregularities occur, from the influence of strong winds, particularly those from the eastward and westward. The highest tide takes place at the third transit after the full and change; but experience shows that westerly winds occasion a higher, and easterly winds a lower tide nearly in proportion to the force of the wind. In the offing it is never slack water; the transition from flood to ebb takes place by a change in the direction of the tide. The first part of the stream runs south, and by degrees south-east, and finally, after the lapse of one or 1½ hours, it sets east-south-east, following the directions of the channels in all their bays and intricacies between and inside the islands. The ebb at first runs north, then inclines to the north-west, and finally runs to the westward out of the channels, when the water has fallen a little.

From these varying courses of the tidal streams it is requisite to know the exact period of the flood or ebb, as in the one case they set strongly towards the shoals, and in the latter from them; likewise strict attention should be paid to this fact, that the first half of the flood follows in the direction of the channels, the edges of which are somewhat shallow, whereas on the bars and on the shoals it sets obliquely across them, nearly in a south-east direction; hence it is of the greatest importance to allow for this when entering the channels on this coast. The rate of this stream in settled weather is commonly 1½ to 2 knots, but during boisterous weather and westerly winds it may attain a velocity of 4 knots. It requires a favourable tide to enter or to leave the channels.

SÜDER and NORDER PIEP.—The Süder and Norder Piep are inlets leading from the sea, between the extensive shallows to the westward of the shore of Dithmarschen, to the harbours of Büsum, Warverort,

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[*] *See* Admiralty Tide Tables, Tidal streams in the North sea, page 144, Compartment XVI.

Wöhrden, Meldorf, and Barlt; the southern inlet has at its entrance a sufficient depth for vessels of large draught, and thus afford anchorage and shelter; the northern one is barred by a flat 1½ miles wide, extending outside the entrance buoy, having from 6 to 15 feet over it.

Beacons.—As a guide to the above inlets, on the south side of Süder Piep a safety beacon 57 feet high, consisting of a mast with four supporters carrying a triangle of trellis, the sides of which are 6 feet long, with a sphere above it, is erected on Böschsand Polln (Trieschen), a sandbank which is dry at high-water ordinary springs, and rises from the outer shallow between the Süder Piep and the Norder Elbe; from this beacon Neuwerk high lighthouse bears S.W., and Büsum church E. ½ N. The beacon is fitted with a chamber containing bread and water for shipwrecked crews, there is also a flag which can be hoisted as a signal for assistance.

On the shallowest spot of Blauort sand, on the north side of Norder Piep a similar beacon is likewise erected; it is of the same height as the former with four supporters, and carrying on the top a 6-feet cube of trellis. This beacon stands nearly N.E. 6 miles from Böschsand beacon, and S.S.E. from the Eider light-vessel at the Sandlock inlet.*

Buoys.—In the Süder Piep there are the following buoys, viz.:—

On the south side the outermost or Fairway beacon buoy, yellow with black top, and its name *Süder Piep* painted on it, lies in about 8 fathoms at the lowest tides, on the north sides of the shallow extending westward from Böschsand Polln, and bears W.N.W. 8 miles from Böschsand beacon, and N.E. ¼ E. 6½ miles from the outer Elbe light-vessel. E. ½ N. one mile from this is a yellow can buoy marked S. P., and onward in succession are placed fourteen black ones numbered I. to XIV., along the south side of the channel. The outer buoy is placed in such a manner that vessels coming from the southward and steering for it, may stand across Böschsand Polln flat in 15 feet at low water.

On the north side are white nun buoys placed as follows:—A. with a beacon, 5¼ miles East from the Fairway and abreast of No. IV. black buoy; B. also with a beacon, at the south extreme of the Mittel plaat Trindel, S.E. ½ S. 2¼ miles from A.; and C., D., and E. on to K. at the south-eastern edge of the Mittel plaat, opposite to Bielshöven sand, at the narrowest part of the channel, and to its junction with Norder Piep.

The south side of the channel (Russen loch) from the black buoy XIV. is marked by stick beacons with brooms.

At the entrance to the Norder Piep, on the inner side of the bar, is a black buoy with a staff and red cross, marked *Norder Piep* N.E. ¾ E. 5¾ miles from the Fairway buoy; within this are three white buoys to be left on the port hand; and on the same side along the edge of the sands bordering the main channel to Büsum and other ports are numerous stakes with broom tops.

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* In 1875 the Blauort sand safety beacon had to be shifted one-third of a mile to the N.E. on account of the sand having been washed away.

TIDES.—It is high water, full and change, at Blauort sand at 0h. 38m., springs rise 12 feet. At Büsum 1h. 21m., springs rise 12 feet.

DIRECTIONS.—In approaching the entrance of the Süder Piep it must be borne in mind that the bottom in the mouth of the Eider is oaze, but to the south-westward it is sand on the flat extending from the Tertius and Blauort Polln, which should not be approached within the depth of 4 fathoms; immediately to the southward of the flat there are 7 to 8 fathoms, oaze and blue clay in the Süder Piep. Still farther to the southward the bottom is again sand, on the flat from Böschsand Polln, and farther to the southward, oaze in the Norder Elbe, then sand on the flat from Vogelsand, until in the mouth of the Elbe, where the bottom everywhere is soft. By paying a minute attention to the soundings, and to the bearings of Helgoland, or of the light-vessels in the Elbe and Eider, and a look-out for both the Böschsand Polln beacon and the large tower of Neuwerk, the mariner will, provided it is clear weather, be able to shape a proper course for the Süder Piep.

Vessels from the Elbe, bound to the Süder Piep, should steer outside the flats projecting from Great Vogelsand and Böschsand Polln. The outer light-vessel at the Elbe kept on a bearing S.W. by S. will carry a vessel over the tail of the Böschsand Polln flat; or the large tower on Neuwerk S. by E. ½ E. will also clear it in about 4 to 4½ fathoms; when in the deep-water channel in 8 fathoms and North of the Fairway buoy, an E.S.E. course will lead along the line of black buoys on the starboard hand. Small vessels may pass over the Böschsand Polln flat in about 8 feet at low water, but after clearing the Vogelsand, during a flood tide, the large tower on Neuwerk must not be brought more to the westward than S. ¼ W., which bearing will lead across the flat to the Fairway buoy.

Vessels from the northward may pass across the outer part of the flat from Blauort Polln, in 15 feet water, keeping Tating church (Eiderstedt) open to the northward of St. Peter beacon, page 227, which will lead towards the outer buoy on the Böschsand Polln flat, then proceed as before into the inlet, between the white and black buoys.

Coming from the westward, Helgoland lighthouse should be kept N.W. by W., while it is visible, and when the outer light-vessel in the Elbe bears S. by W. ½ W., 6 miles distant, steer E. by S., rather easterly during a flood tide, and rather southerly during the ebb tide, which will lead to the northward of the Fairway buoy, to mid-channel in 8 to 8½ fathoms water, blue mud and mussel shells.

When working into the Süder Piep, do not stand nearer than into 5 fathoms on the south side, as the Böschsand Polln flat is steep-to, and on the north side do not stand too near the bar that borders the Norder Piep, as the flood tide sweeps towards that inlet.

Having arrived as far eastward as to be near black buoy No. V. on the edge of the Böschsand Polln, the channel becomes narrow and runs in an easterly direction for about 7 miles to the Norder Piep or the Miele river. The southern edge of the Mittel Plaat Trindel is steep-to; but the water shoals more gradually towards the northern edges of the Böschsand and Böschsand Polln which are uncovered.

Norder Piep.—After crossing the bar of the Norder Piep, the channel is broad and direct for 9 miles above the bar buoy on a S.E. by E. ½ E. course, keeping the white buoys and beacons on the edge of the Blauort sand on the port hand; then steer S.E. past the junction with the Süder Piep towards the Miele river.

LIGHT.—Büsum harbour light is *fixed*, and visible for about 5 miles; the light is exhibited at an elevation of 32 feet above the sea, from a mast on a wooden house on the dike westward of the harbour.

BÜSUM HARBOUR.—The last beacon on the south-east side of the Busumer Hinnerk sand, is at the entrance to Büsum harbour. During a flood tide, which sweeps up the Miele river, a vessel should, on approaching the beacon, hug the northern shore; the eastern mill at Büsum, kept close outside the easternmost house of the village, is the mark for entering close round the beacon, which, as well as the rest of the beacons, should be kept to port in entering. The entrance first leads N.N.E. ½ E., then E.N.E., and E.S.E., with 2 to 4 feet water with a common low water; at 2 cables to the southward of the southernmost point of the dike, it takes an abrupt turn towards N.N.E. and N.E., until the harbour is open to view, when the course in is N.W. On the north side of the harbour there are mooring posts.

The depth at high water ordinary springs is 8 feet, and, therefore, it may admit vessels drawing 7 feet, but at low water they are left dry on the muddy bottom. By means of a sluice, the harbour is kept clear, and consequently, vessels are less easy here than in the entrance, abreast of the third beacon, where the shallows afford shelter.

There are several passages with shallow water into the Eider across the watts or flats, but only practicable at high water to the small craft that trade between the Elbe and Eider; but these gullies in the sand being merely marked by a few stick beacons, and subject to frequent changes, should only be attempted by those well acquainted with the localities.

Miele River.—The Miele Fluss, or river, being a continuation of the Norder Piep, to the eastward, and afterwards to the southward along the coast, gives access to the harbours of Warverort, Wöhrden, and Meldorf. From the elbow beacon, at the entrance of the narrow channel leading to Büsum, the reach of the river is S.E. by S., branching E.N.E. from the West point of Helmsander steert, between the shallow from the shore and Stotter spit, with a depth of 4 to 5 fathoms, and a breadth of 3 to 4 cables; and on the south side, the edges of Helmsander steert are steep-to, though some projecting necks of this sand extend towards the deep-water channel.

Along the north side, on the dry edge of the shallow from the shore, stand stick beacons, to indicate the direction of the channel between Büsum and Warverort. At the last beacon, which points out the inlet to Warverort and Wöhrden, the channel is only a cable's length across, with a depth of 10 to 12 feet; and on both sides shallows, which are steep-to. The vessel will then be just abreast of the northernmost spit of Helmsander steert, and from hence the channel, which ceases to be beaconed, trends southerly between this sand and the shore, and terminates at the priel to Meldorf harbour. The principal channel to Meldorf is a continuation of the reach running S.E. by S. from Büsum in an E. by S. ½ S. direction for 2 miles from the southern point of Helmsander steert to the entrance of the inlet to Meldorf; the south-west and south edges of Helmsander steert are beaconed. Two white spire buoys lettered A and B, buoy A at the western end of Helmsander steert and buoy B at the eastern end, are placed on the north side of the channel, and which have to be kept on the port side when entering it.

WARVERORT HARBOUR.—From the above beacon, the inlet branches off to Warverort harbour, being two-thirds of a mile long, first N.N.E. and then with several sinuosities, which make the navigation difficult. The small beacons standing on the western side of the inlet, should be kept to port. Outside the sluice, the harbour is formed between two wooden piers of short extent, and a few posts, to make fast to, are placed along its edges. The depth in the harbour at ordinary high water is 8 feet; it will, therefore, admit vessels drawing 6 feet.

WÖHRDEN HARBOUR.—From the same beacon, the inlet to Wöhrden branches off E. by N. for a mile, and then East, E.N.E., and E.S.E., towards the new harbour in front of the sluice, which is distant 2 miles from the beacon. Along the north side of the inlet, there are small beacons, which should be kept to port; and vessels drawing 5 feet may use this harbour, but it is difficult to leave with westerly winds. Since König Christians Koeg has been surrounded with dikes, vessels may load or unload there, but the custom-house is at Wöhrden.

MELDORF HARBOUR.—Off the inlet to Meldorf harbour there is a good road and shelter with all winds, in 7 to 10 feet water, along the shallow from the shore, and in 20 feet along Helmsander steert. The channel to the harbour branches off S.E. by S. from the point or elbow beacon, a distance of 1½ miles, with a depth of 3 to 4 feet along its north side, where stick beacons which stand on the dry sand are to be left to port. During a flood tide, keep close to the beacons, as the shallow from Elbersbüttel steert is steep-to.

On the last of these beacons a mark is shown to indicate an anchorage, where vessels at low water are left dry on the mud; from thence the inlet lies S.E. and E.S.E. a third of a mile, with beacons on its north side; farther in it is dry at low water, but lying in a northerly direction close to the shore outside the dikes, and then E.S.E. towards Meldorf church, and forming, before arriving at the mouth of the harbour, two abrupt turnings, which are a great annoyance in going in or out; the stick beacons are placed along the north side of the inlet. The harbour has been improved by tolerable wharves and mooring posts. The depth in the middle of the harbour is 10½ feet, and will therefore admit vessels drawing 9 feet.

The Flackström leads south-eastward from the Süder Piep, between black buoys Nos. VII. and VIII., off the west point of Bielshöven sand. From a third of a mile to the westward of No. VIII., steer south-easterly, so as to leave the buoy to port; pay attention to the lead, as the water will shoal from 5 to 3 fathoms, which is the least depth on the bar between the north end of Böschsand and Bielshöven sand. Having passed the bar, the depth soon increases to 4 and 4½ fathoms, and the channel runs S.E., and S.S.E. with 3 to 4½ fathoms; but the shallows are steep, particularly towards the Riesensand, which are marked with broom beacons.

ANCHORAGES.—In the Flackström there is anchorage for large vessels, and shelter even with westerly gales, from the Riesen, Böschsand, and Böschsand Polln, which are dry at high water ordinary tides, and only covered in the highest tides. However, as the Böschsand and Böschsand Polln have during the last few years been of less height above water than formerly, the anchorage in the Flackström is not now so safe.

In the Süder Piep a vessel may anchor in a convenient depth, according to her draught, on the flat of Böschsand, and lie sheltered against all winds from West, round south, to E.N.E. Vessels drawing less than 4 feet may, at three-quarters flood, run by the lead along the east side of the Böschsand Polln and anchor between that shoal and the Böschsand, where they are left dry on the oaze at half tide and well sheltered against all winds, even westerley gales, as long as the sands outside are above water.

To the northward of the buoy No. VII. off the Flackström, in the bay formed by the Mittel Plaat, a vessel may anchor according to her draught in 3, 2, or one fathom at low water, sheltered against north and easterly winds; but a sea sets in with those from the westward. Farther in the Süder Piep a vessel may anchor anywhere to the southward of the Mittel Plaat; but with westerly winds against an ebb tide the sea is rather rough.

With southerly winds there is a good road for large vessels in the Miele river, off Helmsander steert; and with northerly winds on the flat from the shallow to the southward of Büsum, with the church of that village bearing N. ⅔ E. The tide is much stronger in mid-channel than on the shallow.

The RIVER EIDER discharges its waters between the far-extending shallows of the Dithmarscher gründe, and of those projecting from Eiderstedt. At the fortress of Rendsborg, the Slesvig Holstein canal branches off from this river, and thus forms a navigable communication between the Baltic and the North sea. The river runs with several sinuosities and bendings from Rendsborg, past the towns of Friedrichstadt and Tönning. The channel is intricate and, in many places, narrow, which are obstacles that render the pilotage of this river both difficult and troublesome, and which, with certain winds, it is impossible to surmount. With a view in some degree to remedy these impediments, a steam-tug is stationed at Tönning.

The breadth of the Eider at the entrance, the Fairway of which is subject to almost yearly changes, where the light-vessel is stationed is 500 yards; both sides of the channel are well pointed out by black buoys on the south and white buoys on the north, and farther in, between Vollerwick and Tönning, by stick-beacons. The white buoys are marked on their sides with Roman letters, and the black buoys with Roman numbers, in alphabetical order, and in running numbers from the entrance inwards. A part of the buoys in the Eider, as well as the Fairway steeple buoy lying westward of the outer buoy, are taken away during winter and replaced by ice buoys.

LIGHT-VESSELS and LIGHTS.—To facilitate the approach to the Eider a light-vessel is moored in 7 fathoms about 10 miles outside the bar, in lat. 54° 15′ 50″ N., and long. 8° 17′ 30″ E. She has three masts, is painted black with *Eider* in white letters on her sides; on each mast head is a black ball, and when not in position a black flag with a white square, will be hoisted on the mizen mast. From the main is exhibited a *fixed* white light, at an elevation of 35 feet, which is visible 8 miles in clear weather. In foggy weather a bell will be sounded for five minutes with an interval of five minutes, and signal guns will be fired when vessels are taking a dangerous course. The position of the vessel is, E. ¼ N. 15 miles from Helgoland lighthouse; N. by. E. ¼ E. 16 miles from the Elbe outer light-vessel; and W. ¾ N. 13 miles from St. Peter's beacon.

The Inner Light-Vessel is moored inside the bar in 2 fathoms at the main entrance of the river, E. by S. ¾ S. 10 miles from the outer one; she has two masts, is painted red with a white line, and her name *Eider* in white letters on her sides, and carries a ball at the fore, 62 feet high. The light is *fixed*, elevated 34 feet, and is visible 10 miles. The light is exhibited from about the end of February to the end of November, the light-vessel is removed during the winter season. Notice is always given of these changes. In thick weather a bell is sounded, and gun fired. Eight pilots usually reside on board.

Vollerwick upon the embankment below Vollerwick, at the north side of the river about 8 miles above the entrance, are two small *fixed* white lights elevated 28 and 13 feet respectively, and visible 4 miles. The lights in line lead in mid-channel.

On the embankment in front of Vollerwick, there are two *fixed* white lights at an elevation of 32 feet and 12 feet, and visible 4 miles. The lights in line lead through the western part of the Purren ström.

Tönning.—On the embankment are two small *fixed* white lights, the higher 32 feet and the lower 22 feet above the sea, visible for 4 miles; when in line the lights lead through the eastern part of the Purren ström.

Whilst the navigation of the river is interrupted by ice the lights at these last three places are not exhibited.

Beacon.—St. Peter's beacon, erected on a sand hill 25 feet above high water, S. ⅓ E., and a long mile from St. Peter church, in Eiderstedt; it is a pyramidal wooden beacon 71 feet high, and carries a pentagonal trellis, which faces S.W. by W.

Buoys.*—About 6½ miles E. by S. ¾ S. of the Outer light-vessel in 4¾ fathoms water, is a conspicuous steeple or Fairway buoy surmounted by two balls; and 1¾ miles E.S.E. from it is a red conical buoy with staff and two balls, in 3½ fathoms at low water, with the Inner light-vessel E. by S. On the bar, outside the Inner light-vessel, three black buoys Nos. I., II., and III., (the outer No. I. with two balls), mark the south side of the channel, and two white buoys A and B mark the north side; and above, the channel is marked as before mentioned, by black buoys on the starboard and white on the port hand entering.

PILOTS reside on board the inner light-vessel, and when the signal is made, they attend, and if prevented from coming alongside on account of the sea, the boat leads, and the vessel must follow in her wake until arriving in smooth water in the river, where the pilot may be taken on board.

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* The positions of these buoys have at times to be changed to correspond with the alterations which take place in the sands.

After the removal of the light-vessel on account of the ice, a pilot steam vessel cruises in the mouth of the river until the navigation is entirely closed.

Life-boat.—A life-boat is stationed on board the Inner light-vessel.

TIDES.—It is high water, full and change, at Eider river entrance at 0h. 0m., springs rise 10 feet; at Tönning at 1h. 55m., springs rise 11½ feet.

DIRECTIONS for the EIDER.—On approaching the outer shallows, the objects that will be recognised if the weather be clear, are Tating church, having a large tiled-roof and a high painted steeple, together with St. Peter mill, and Wesselburen church in Norder Ditmarschen; the shore in front having a dark hue. By bearings of these landmarks, the position of a vessel may be ascertained, but the island of Helgoland is the most useful object for making the Eider or any other of the inlets between the Hever and the Elbe.

Approaching the entrance to the Eider from the westward, Helgoland lighthouse should be kept bearing W. ¼ N. until lost sight of, which will lead about 1½ miles to the southward of the Outer light-vessel, and on to the Fairway buoy; on this track the soundings will gradually diminish in depth. Near the mouth of the river, the depth is 5 to 6 fathoms, light-coloured sand, with shells and oaze, whereas farther northward the soundings are gray sand. On* the bar there is at low water 1¼ fathoms, and to cross it vessels should steer from the red buoy on an E. by S. ½ S. course, and keep between the black and white buoys from black buoy No. 1 and white buoy A.

When from the northward, do not come into less than 4½ fathoms water, and if the tide be flood, as the first part of it sweeps to the south south-east towards the Blauort sand, the light-vessel should be brought to bear about E. by S. ½ S., which bearing will lead between the line of buoys outside the light-vessel.

Vessels approaching the Eider from the southward, should steer outside the shallows of Böschsand Polln and Blauort sands, guided by the lead, the beacon on Böschsand Polln, and the Steeple red buoy; having closed the latter proceed as before.

Abreast of Vollerwick there is a good roadstead or stopping-place to await a change of wind or tide, and from thence the channel is 2 cables wide, with 4 to 7 fathoms water close along the dike, having on the south side four black buoys, carrying brooms. During a flood tide keep close to the northward of the last buoy, in order to avoid being carried to the northward of the sand-bank in a bight extending nearly to Kating Siel.

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* The bar since 1871 has moved a little to the south-west, and the depth has at the same time increased. The depth on the bar is generally 12 feet less than at the red buoy.

The interval between the last black buoy and the town of Tönning is called the Purren ström, and curves from S.E. by S., to E.S.E., E.N.E., and N.E. by E.; it is little more than a cable wide, with a depth of 2½ to 3¼ fathoms, and steep shallows on both sides, marked by stick-beacons. The two lights in front of Vollerwick, and those at Tönning, are intended to lead through the channel. The western beacon on the south side stands S.W. from Kating church, and carries a trellis on its top. At 2 miles from Tönning there are 9 to 14 feet water, but farther on, 3½ to 6 fathoms close to the dike, the depth increasing as the vessel advances; and in the road abreast of the harbour the depth is 3 fathoms at low water ordinary springs.

From the bending of the Eider along the north or Koller sand, the priel, or little channel of Ehster Siel, with a depth of 9 feet at high water springs, trends N.N.E. and North towards the dike, on which there is a sluice forming a harbour for small craft; the stick-beacons along this inlet should be kept to port in entering.

Kating Siel priel trends from N.N.E. to E.N.E., then N.W. and North towards the sluice at Kating Siel; it is pointed out by stick-beacons, which should be left to port in entering; the mid-channel of the priel forms a harbour, in which there are 9 feet at high water, but along the piers on both sides only 4 feet.

By night.—Bearings of Helgoland light and of the outer light-vessel, with attention to the soundings, will guide to the Fairway buoy at the entrance of the river; the Inner light-vessel then brought to bear about E. by S. ½ S. will lead over the bar.

It is advisable, however, for strangers to take a pilot before entering the river, on account of the tides, &c., see page 226.

TÖNNING HARBOUR, commencing N.N.W. through the dike, turns W. ¾ N., W.S.W. and North towards the sluices. The harbour is well secured by piers, bulwarks, and mooring piles; it has a shipyard, and also a slip on which vessels may be hauled up and repaired. On the west side there are quays where vessels and steamers can load and unload. Its depth in the middle varies from 6 inches to 2 feet, at ordinary low water, but along its sides it is then 2 feet dry; however, the bottom being oaze, vessels are not in the least injured by being left dry at low water. At high water the depth is 10 feet in the middle of the harbour, and therefore admits vessels drawing 8 to 9 feet.

A railway connects Tönning with the northern and eastern lines, and a submarine telegraph, viâ Helgoland, with England.

Schülper Siel Harbour.—From the Purren ström, with Kating church bearing N.W. by N., a priel, with 8 to 9 feet at ordinary high water, takes the course of S. by E., S.E. by E. and South towards the outer dikes, and thence S.S.W. ¼ W. towards the sluice which forms Schülper Siel harbour, admitting vessels drawing 5 to 6 feet.

Life Boats.—A life boat is stationed near Kating Siel; and one a little to the south of Saint Peter's beacon.

The LOWER and UPPER EIDER.—The navigation farther up this intricate river, from Friedrichstadt to Rendsborg, is difficult, and is more frequently performed by tracking the vessel along, than by using sails. The size of the vessels which are able to pass through the canal depends on the locks, which are, 95 feet long, 25 feet wide, and have a depth of 8¾ feet.

The Lower Eider from Tönning to Rendsborg is in general practicable to vessels drawing 10 to 11 feet. The shoalest places are in the Breiholz reach, where, from a continuance of easterly gales, the water may fall 6 feet. The channel is marked by white buoys on the Slesvig, and black ones on the Holstein side.

Friederichstadt harbour has a depth of 10 to 12 feet, and Rendsborg harbour 11 feet at high water.

In the Upper Eider, from Rendsborg harbour to Föhrde, at the entrance of the Slesvig Holstein canal, the depth is in general 15 to 16 feet, except at the powder magazine of Rendsborg and at Föhrde, where it is only 8¾ feet, being thus somewhat less than the depth in the canal, which is 9 feet.

Northern Sandloch.—This inlet likewise affords access from sea into the Eider, between the Hitz grund and the shallow of St. Peter, and the dry central sand-banks to the southward, named the Western flat; but it is only during settled weather practicable even to small craft, as the depth at low water is but 3 feet in its southern part. It is only used by the coasters.

HEVER STRÖM.—The several entrances to the Hever have undergone much change, the principal channel lies between those formerly known as the New and the Old Hever Ström, and is now called the Middle; it is buoyed in the arrangement previously described, up to Husum road, abreast of Hafenhalle Nordstrand island; also to Pellworm harbour by the North Hever.

The New (South) Hever, between the Outer Guagegrund on the north and the shoals bordering the mainland of Eidersteidt on the south, has also on the south side some black buoys leading up to the junction with the main stream.

Beacons and Buoys.—St. Peter's beacon, page 227, will be found of service making for the Hever. Süderoog is a conspicuous black beacon erected on the Süderoog sands north-east of the entrance; the beacon is 90 feet high, the lower portion from 17 feet forming the main support of the beacon which is in the from of a triangular prism, two sides of which face the sea, and the third the tower of Pellworm, the outer angle is directed towards the Fairway buoy of the Middle Hever, the beacon has two distinguishing marks at the top, the upper one being a ball, and the lower when seen from the Middle Hever fairway buoy will appear as a mast, but if either north or south of this direction the lower mark will show the form of an hour glass. In the beacon there is a refuge chamber for shipwrecked crews. Pellworm tower (an old church) on the west side of that island; and Seesand beacon, page 237, also assist the navigation of this low and dangerous coast. *See* views on Admiralty chart, No. 1,887.

There is a Fairway beacon buoy, with its name *Mittel Hever* painted on it, lying in about 5 fathoms off the Middle Hever outside the Quagegrund, it bears E. by N. ¾ N. 19½ miles from Helgoland lighthouse, N.E. by N. ½ N. 6½ miles from the outer Eider light-vessel, and S.W. by W. ½ W. 6¼ miles from the Suderoog beacon in line with Pellworm tower. E. ½ N. 2¼ miles, and E. by S. ¼ S. 1½ miles from it, is white buoy A, and black buoy No. I., between which is the entrance, about half a mile wide, of the Middle Hever, which is buoyed on both sides for 15 miles up; afterwards by black buoys only, and perches on the port hand. The black buoys are marked with Roman numbers from the outside, Nos. I. to XXIX., and have black poles with balls; the white buoys are lettered, A. B. C. and D. with a white staff and ball, and on to N. without.

The entrance to the South Hever is marked by a Fairway steeple buoy, with mast and ball, which bears S.E. ½ E. 5 miles from the Middle Hever fairway buoy, and E. by N. ¾ N. 7½ miles from the outer Eider light-vessel; within, to its junction with the main channel at No. IX. black, are three black can buoys having poles, the first two with an hour-glass and the innermost with two balls on the top, marking the starboard side of the deepest water.

The North Hever to the anchorage off Pellworm, branches from the main channel between the white buoys E. and F., and after passing a chequered black and white buoy on the starboard hand at the south-west point of the Hever steert, the ordinary arrangement of coloured buoys, but with small poles, leads up the channel, in which will be found from 5 to 8 fathoms of water.

TIDES.—It is high water full and change at Husum, at 2h. 20m., springs rise 11 feet; and at Pellworm harbour, at 1h. 50m., springs rise 10 feet.

DIRECTIONS.—The flood tide sets in the direction of the channel. Vessels approaching the entrance of the Hever Ström from the westward should get bearings of Helgoland, those from the northward may be guided by bearings of Seesand beacon, and those from the southward by bearings of the light-vessels at the mouth of the river Eider, and St. Peter beacon on the main. Close outside the mouth of this inlet, as also to the northward and southward of it, there are 5 to 6 fathoms water, fine gray sand, and, in anything like clear weather, the shore at Ording and St. Peter is visible, though the sand-downs are low, and with a light yellowish tint. St. Peter church and mill are the most conspicuous, and, in very clear weather, Ording church, with its low tower and short spire, shows between the sand-downs. Pellworm tower and the house on Süderoog are just visible on the horizon.

It would only mislead to offer any particular directions for navigating the several channels of the Hever; so many changes have taken place in the position of the banks, and which are constantly going on, that any given course of to-day might be the means of running the vessel into danger a short time hence. A pilot's assistance is essential, but if the risk of running in without one is decided on, bring Pellworm tower in line with Süderoog beacon N.E by E. ½ E., which will lead to Middle Hever Fairway buoy, keep just to the northward of this buoy in 5 fathoms, and steer about E. ½ S. to cross the bar, on which to the N.E. of No. I. buoy there is a patch with only 15 feet water on it, half a mile in length in an E.N.E. and W.S.W. direction, pass between Nos. I., and II., black buoys, and the white buoy A in 3¼ fathoms at low water, the depths will then increase until eastward of No. III. buoy; thence to the junction with the North Hever from 8 to 5 fathoms will be found; afterwards the channel becomes much narrower, and the depths uncertain, varying from 3 to 9 fathoms in some holes. The deepest water is maintained by proceeding up between the buoys and perches, which are placed sufficiently near to each other to be made out in ordinary weather, and with proper caution to lead clear of the dangers they bound. In the anchorage off Hafenhalle Nordstrand, there is a depth of 3½ and 4½ fathoms.

Small vessels coming from the southward usually enter by the New (South) Hever, over the bar there is a depth of from 12 to 15 feet; the bar extends 2½ miles outside of the Fairway buoy on the bearing of N.N.W. of the Middle Hever buoy, and may be crossed on an E. by N. ¼ N. course. At the Fairway buoy, and to the bar at the junction of channels, the deep water of 5 to 8 fathoms is of moderate width, but over the inner bar to between No. IX. and X. buoys there is again 12 to 15 feet.

HUSUM HARBOUR.—Inside the outer beacon of Husum river there are smaller ones, which in entering are to be left to starboard. The direction of the river, with a depth of 10 to 11 feet, at high water, is first E.S.E. directly for Husum church, visible between the straw, reed-covered dykes, about one mile. Farther in, the entrance is very crooked but it has been made somewhat more direct by a canal, cut in a south-east direction, to a depth of 12 feet, and a breadth of 20 feet at the bottom and 40 feet at the top. Two artifical shores have been constructed, nearly up to the common high-water mark, and, to prevent their being washed away, they are thatched with reeds. Through this limited aperture, it is supposed that the ebb tide, in running out with increased velocity, will produce a depth of 14 feet through the whole of the river.

There is a small anchorage in Husum road in 18 feet at low water, sheltered from all winds and good holding ground, with Hattstedt and Schobüll churches in line.

From the beacon off the south-east side of Nordstrand, small craft may at half-flood stand across the shallow, and run into Moordick.

From the last beacon on the Nordstrand side, a narrow and tortuous channel leads to Englands loch, but only practicable to such small crafts as trade between Nordstrand and Husum.

From Dörheits beacon, carrying a broom, and standing on the northern spit of Lunderburg sand, the Simonsberg loch trends first S.E. by S. across the bar with one to 2 feet water, and then, with several turns, falls into the shallow, dry at low water, between Heckelskoeger hallig * and the shore abreast of Simonsberg. Immediately inside the bar, there is a hole with 2½ fathoms water; but farther in, it is dry at low water.

ANCHORAGES in the HEVER STRÖM.—To the eastward of No. VII. buoy, a vessel may anchor off the shallow in 15 to 24 feet, sandy bottom, with St. Peter mill in line with Ording church, and sheltered from winds from S.S.W., round south to East.

Off Südfall, with the house bearing North, there is anchorage for small craft, close to the island, at half-flood, where they must lie dry on an oaze bottom at low water. This bight is pointed out by three small stick-beacons which should be kept to port in entering.

Off the inlet of Tetenbüll Spicker, there is a good anchorage in 2 fathoms, oaze bottom. This inlet, from the outermost beacon, runs S.W. ½ W. and then S.S.W., with 9 to 10 feet at high water, along the small beacons on the western side. The harbour consists of two basins, but the westernmost has the best anchorage. Vessels drawing 7 feet may enter this harbour in safety with all winds. In entering bear in mind that outside the dry sands the tide sweeps across the inlet.

OLD HEVER STRÖM enters from the sea to the southward of the Süderoog sand, upon which is the beacon, and which dries 5 miles to the westward from Süderoog island. Its south side is bordered by some shelves and sand-banks separating it from the Middle Hever. Vessels from stress of weather, and not able to weather the coast on either tack. might find a refuge by entering this inlet, as it leads to a sheltered anchorage off Pellworm; but as it is not buoyed, it should only be attempted in great necessity; in which case the following directions with the aid of the chart may be useful to navigators on such a dangerous coast, where every possible resource is of consequence.

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* Hallig signifies an island without walls.

DIRECTIONS.—The flood stream follows the direction of the above inlet, which is an essential advantage compared to others, where the tide sweeps across their mouths. During clear weather, when the objects on shore may be seen, bring Süderoog beacon to bear E. by N. ¾ N., and when Seesand beacon (if it can be seen) bears N.N.E. the Fairway Middle Hever buoy will bear S.S.W. about a mile off, then steer E. ½ N. in a depth of 4 to 5 fathoms to the southward of Süderoog sand, the shallow flats of which are indicated by the surf on them, when there is anything like a swell. As soon as Süderoog beacon bears N.E. ½ N., steer E. by S. ½ S. in mid-channel between the breakers, and in 3¾ to 4¾ fathoms water; the shallows are steep-to on the north side of the channel, which is narrow; do not come therefore too near the latter, but keep along Süderoog sand by the lead.

When Pellworm tower is in line with the house on Süderoog, the dangerous part of the channel will be passed, and the vessel will be at the eastern edge of the middle bank, and the depth about 6 fathoms in the channel, which is pretty wide, but has several patches mid-channel, though none with less than 2 and 3 fathoms.

Having entered the buoyed channel near No. VIII. black, steer up between No. IX. and E. white, leaving the black and white chequered buoy which separates the North Hever from the Middle Hever on the starboard side, into the North Hever on a N.E. by E. ¼ E. course towards the south-east point of Pellworm, keeping it a little on the starboard bow; this course leads towards the shallow off Pellworm, which should be hugged if the wind is scant, for the flood tide sweeps to the eastward, towards Heversteert sand, which is steep-to. When the tower bears N. ¾ E., and between a white and a black buoy, keep along the shallows on an E. by N. ½ N. course past the next white buoy for the anchorage.

Pellworm Harbour.—From the above anchorage, the course to Pellworm harbour is N.N.E. ¼ E. along the shallow from the shore, between it and the Pellwormer bank; having made out the outermost stake beacon, keep it in line with the northern point of the dike. The water shoals gradually to 6 feet, a third of a mile from the last-mentioned beacon, which is 2 feet dry at low water; but the inlet to the quay in the harbour, leading close to the northward of the small beacons, is somewhat tortuous in a N.W. by W. direction, but has a little greater depth. The direction of the harbour from the quay to the loch is W.N.W. Owing to the bar at the mouth of the inlet, this harbour can only admit vessels drawing 6 feet, and these lie dry at low water.

At the north end of Rongholt sand the channel branches off into two different inlets, the easternmost of which leads to Nordhafen in Nordstrand island, and afterwards in a S.E. by E. and E. by S. direction along the north side of Nordstrand, but shoals farther in and joins Holmer Fähre, in 4 feet water in the vicinity of Hattstedt Dike.

Nordhafen Harbour.—From the anchorage, the direction up is N.E. by E. and when the telegraphic beacon on the Rongholt sand bears S. by E., a vessel may run into Nordhafen by steering S.E. by E. ½ E., in 4 to 6 fathoms water, past the black buoy, and along the small beacons standing on the north side of the sand, nearly in the direction towards Hattstedt church, conspicuous by its height and its pointed steeple. The point beacon, with two brooms showing the entrance to the harbour, is placed N. by W. ⅔ W. from the northern mill on Nordstrand, and from thence the course is S.E. and S.S.E., in 3 to 5 feet water along the small beacons on the south and west sides, which should be kept to starboard. Nearer the dike the inlet is tortuous, and dries at low water. The direction of the harbour is N.N.W. and S.S.E., and it admits vessels drawing 3 to 4 feet. Two cables' lengths to the eastward of the outer stake-beacon at the inlet, there is good anchorage in 2 to 3 fathoms, sandy bottom. Nordstrand is in communication with Holstein by means of a telegraph cable.

Bordelum Harbour.—The other branch of the channel, when Hattstedt church bears E.S.E. nearly, and the house on Südfall island S.W. by S. ¼ S., leads from the telegraphic beacon on the point of Rongholt sand, in the direction of N.E. ¼ N., and in a depth of 3 to 4 fathoms, along the steep shallows from the north-east side of Pellworm, which should be kept close to, as the Nordstrandischmoor side of the inlet is foul, having, at half a mile to the N.W. from the west end of Nordstrandischmoor, a bank with 2 fathoms water. Between the latter and the banks to the southward of Hamburger Hallig the channel takes an E. by S. ½ S. direction for 1½ miles. Hence the inlet to the small harbour at Bordelum trends to the north-east. Small craft drawing 6 feet may enter this harbour, which is so narrow as not to allow two vessels to lie alongside each other in the channel, and is entirely destitute of quays and moorings, or posts to make fast to.

On the shallow from Pellworm to the northward of the harbour, stake beacons are placed towards the Beens and Hamburg Leys ; the entrances to those Leys are marked by a steeple beacon having two brooms horizontally.

Inner channels.—All the inner channels from Eiderstedt to Fano which traverse the sand banks and lead from the islands and the shore to the principal channels and the sea, may, as a general rule, be used at high water by coasters drawing from 3 to 5 feet water. They are ordinarily marked by posts with brooms.

ANCHORAGES in OLD HEVER STRÖM.—Along the south-east side of the Süderoog sand there is shelter against North and N.W. winds, in 7 to 5 fathoms water, but not nearer the sand on account of the steepness of the ground.

Off the flat between Süderoog and Pellworm, the house on Süderoog bearing W.N.W., and Pellworm tower N. by E., there is good anchorage in 2 to 3 fathoms, sandy bottom, and shelter from winds from W.N.W., round north, to E.N.E.

To the eastward of the black, *red*-bottomed upright buoy, with Pellworm tower bearing N. ¾ E., a vessel may stand in on the flat off Heversteert and anchor on sand, sheltered against south and easterly winds; but on the rest of the north-west side of Heversteert the shallow is steep-to from the deep water channel.

To the westward of the southern beacon buoy on the Ochsen sand, with Pellworm tower bearing N.N.W. ¾ W., and the house on Süderoog W. ⅓ N. off the shallow from Pellworm, there is shelter with the winds from N.W., round north, to N.E.

The best anchorage is south of the white buoy which lies on the north-east side of the bight leading to Hafenseil, in 14 to 20 feet water, oaze bottom. The mark for the south end of the bank, on which is the buoy, and which is pretty steep-to, is the house on Süderoog, seen just outside the south-east point of Pellworm, and the old tower in one with the mill to the southward of the new church.

LAND DEEP.—The Land, Ritter, and Schmal deeps are inlets leading to Amrum and Wyk harbours, and to Dagebüll, of which the Schmal is the deepest.

The Land deep leads in from the sea, a little to the southward of the entrance to Fortrappen deep, between the south-western shallow of Amrum and the Westerbrandung, and joins the Schmal deep off the south-east point of Amrum. This channel should only be attempted on an emergency, being without buoys in its shoalest part, very tortuous, with only 1½ to 3 fathoms water, and not a cable wide, and therefore difficult to navigate. When navigating any of these channels the lead must be attended to.

LIGHTS.—Amrum island lighthouse, on the summit of the south-west part of the island, is round and of a dark brown colour, 137 feet high, and exhibits a white light showing *a flash of six seconds* duration *every twenty seconds* at an elevation of 207 feet above high water, this light is visible in clear weather for a distance of 21 miles.

Amrum harbour light is a *fixed* white light, visible through an arc of 90 degrees, and bearing E.S.E. distant 1,968 yards from the principal light; it is elevated 26 feet above high water, and in clear weather should be seen 6 or 7 miles. The lantern is suspended from two iron lamp posts.

This light in line with the principal light leads into the harbour, and will be exhibited as long as the navigation is not closed on account of ice.

SEESAND BEACON.—The Seesand is a large white sand-bank, liable to change, dry at high water, or only covered at high spring tides in boisterous weather. Its north-eastern spit lies S.S.W., about 4 miles from the south-east point of Amrum island. The extent of the bank is 1⅔ miles N.E. and S.W., and rather more than a mile wide. A wooden beacon is erected on it, formed like a pyramid surmounted by a large flat topped circular board; in consequence of the sand washing away, the beacon had to be shifted to the N.E., it is placed a quarter of a mile from the north-east end of the bank; its height is 62 feet, and it may be seen 10 to 12 miles when the weather is clear, like a cutter with a top-sail. The upper part of the beacon is so contrived as to afford a refuge for shipwrecked mariners, having a supply of water and bread, and a bed. A flag and a ball are also kept to make signals for assistance with on the mast.

This beacon being the most conspicuous mark to be seen when outside the shallows between Amrum and Eiderstedt, is of great importance, as it can be distinctly seen from the depths of 6 or 7 fathoms, not only to warn vessels that have been set too near the coast, but also as a mark for making the entrances to the west and south of Amrum. Besides this beacon, there is Amrum lighthouse to the north, and on the west side of the island of Pellworm, the old square tower in ruins before mentioned, flat on the top, but it is not visible far off, and even in clear weather it is seen only just from the outer edge of the shallows.

DIRECTIONS.—From a depth of 5 fathoms off the inlet, Amrum mill bearing E.N.E. nearly, showing in a conspicuous hollow between the sand-downs, and with Amrum lighthouse about E. by N., and the Seesand beacon S.E. by E. ⅔ E., steer E. ½ N. between the Kaptains knob (which is then in line with the south-east point of Amrum) and Neuer knob; 2½ miles in, leave the black beacon buoy belonging to Fortrappen deep on the port hand; pass close along the south side of the former shoal, which dries at half flood and is steep-to from 4 fathoms. From the dry east spit of this shoal steer E. by S. ¼ S. following the deep-water channel, in which at this part there are at low water from 1½ to 3 fathoms, until St. Laurentü church, the westernmost of the three churches on Föhr, is open of the south-east point of Amrum, when you will be in Norder Aue channel, near No. XI. black buoy.

RITTER GAT, which leads in from sea between the Westerbrandung and the shallow from the Seesand, has on the bar between the sea and the deep-water channel within, a depth of 9 feet, but 2 to 3 fathoms, close to the extremity of the outer Westerbrandung. The bar is a mile across, but this inlet has the advantage, compared to those to the northward of it, that the tide follows its direction; however, with a scant wind it is necessary to keep close to the Westerbrandung until past the bar. About 12 miles off, to the westward of the bar, there are 8 to 9 fathoms water, gray sand with yellow and black specks, and farther in 9 fathoms, bluish clay and oaze, and from thence the depth decreases gradually towards the bar, the bottom being of fine gray sand.

DIRECTIONS.—To cross the bar, bring Amrum mill to bear N.E. northerly, showing a little to the northward of a sand-down, conspicuous between the higher sand-downs—the Saddle and the Grosse, or Amrum lighthouse N.E. ½ E.; Seesand beacon should then be brought to bear about E. by N. ½ N., Pellworm old tower E. by S. ⅓ S.; and the Schmal Fairway buoy S. by E. ¾ E. From hence steer about E.N.E., or nearly half a point to the northward of the Seesand beacon, which course leads close along the Westerbrandung until abreast the beacon. The north side is steep-to along the Westerbrandung, which lies on an E.N.E. bearing, the same as the direction of the channel, where the depth is from 4 to 10 fathoms.

When abeam of the beacon, keep from a half to a point more northerly, in order to avoid the shallow north spit of Seesand. Having advanced so far inside of the Neuerknob, that St. Laurentü church on Föhr is seen open of the south-east point of Amrum, the vessel will be in the Schmal deep, near No. X. black buoy, and a course may be shaped for the last-named point.

The SCHMAL DEEP, the deepest inlet from sea, having about 20 feet of water, but not more than a quarter of a mile wide; its outer entrance is between the Back sand and the Tusch gründe, it then passes between the Seesand and Junge Jap, and is then divided into two channels, one, the Norder Aue leading to Amrum and Wyk harbours, and Dagebüll; the other leading to Bordelum. It is very important for vessels obliged by stress of weather to look for refuge inside the shallows, between which, in this inlet, there are several good anchorages; it ought to be attempted only with the wind from S.S.W. to N.W. and the weather such that the buoys may be distinctly seen, which is an indispensable condition when standing for this narrow and intricate channel, surrounded as it is by dangerous shoals and breakers. In stormy weather, with the wind from N.N.W. and North, no vessel should try to enter, as the flood stream sweeps in a south-easterly direction with such force, that she might not be able to clear the Tusch grounds; in such a case the Ritter gat is preferable, from the course across the bar being more easterly, and from the current following the direction of the passage.

Buoys.—From the sea the entrance is to the southward of Back sand, and is pointed out by a conspicuous Fairway buoy, with two balls on the top, and its name *Schmal tief* painted on it. The Fairway buoy lies in 26 feet water, with Seesand beacon N.E. ⅛ E. 6 miles, Pellworm tower E. ⅛ S., and Süderoog beacon S.E. by E. ¼ E. 6½ miles. Inside this buoy, the east side of the channel is marked by black buoys having white Roman numbers I. to IX. from seaward on them, and the west side by white buoys with letters from A. to E., which last is on the N.E. extremity of the sand extending to the North of the Seesand.

DIRECTIONS.—The bottom and depths outside the Schmal deep are similar to those off Ritter gat. To make the above inlet, bring the Seesand beacon to bear N.E. easterly, in which direction it shows about half a point to the southward of Amrum island, or Süderoog beacon S.E. by E. ½ E. and which will lead to the Fairway buoy. When the weather is clear, and Amrum is seen from the outer buoy, the mill between Saddledown and Grossedown will be visible, about a third of the distance from the last named, Amrum lighthouse about N.E. by N. northerly will also lead to the Fairway buoy. In thick or hazy weather, it will be necessary to pay great attention to the soundings, and if the buoy is sighted before the beacon, shape a course so as to bring the buoy in the above-mentioned direction before steering towards it. Pass to the west of the buoy, and keeping it astern steer about N.N.E. ½ E. until abreast of No. I. black beacon buoy which is on the east side of the bar, then alter course to the eastward so as to pass between white beacon buoy A. and black beacon buoy No. II. No. I. black buoy lies a mile N.E. northerly of the Fairway buoy, the channel then bending E. by N. ½ N. for No. III., then N.E. northerly towards Seesand.

On passing between the buoys it is necessary to keep close to the northern side near the Backsand and Seesand, along which the flood tide sets directly through the channel, to avoid a neck extending from Alte Jap and marked by black buoy No. IX., on which there are 12 feet water, and leaving to the southward an indent with 5 fathoms, trending East to the distance of a mile, where it gradually shoals till it becomes dry, between Alte Jap and Junge Jap sands. It is dangerous to keep on this side of the channel during the flood; for the tide through Ritter gat, sweeping across the neck from Seesand, to the eastward into the South Aue, might set the vessel into this inlet, or on the necks extending from Alte Jap and the Schweinsrücken. At the N.E. point of Seesand the ebb tide sets into the Ritter gat. There is anchorage under the east side of Seesand where pilots for Wyk can be obtained.

The mark for the channel up the Norder or North Aue is St. Laurentii church, on Föhr island, just open of Amrum east point, and the course to be steered past the Seesand and its spit is about N.E. by N. When St. Johanni church on Föhr bears about N.E., then steer for it keeping in an easterly direction, along the south side of the channel, which is marked by black buoys.

When the shore at Wyk opens out, keep along it, and anchor either in the channel in 4 to 9 fathoms, or on the shallow along the shore; but there the depth is irregular, which renders it necessary to attend to the lead. The best anchorage is abreast of the mill and off the south end of the village, 2 to 3 cables from the beach, in 6 to 11 feet at low water. Abreast of Wyk, the channel trends eastward, between banks, which are dry at low water; a mile to the eastward of Wyk, the depth in the channel is 3 fathoms, but ending abreast of Dagebüll, where it becomes narrow, and with a depth of 2 fathoms. Off Næshörn the east point of Föhr, there is a good anchorage in 9 to 11 feet, and close to the point, there is one spot with 3 fathoms.

Amrum Harbour, close inside the south point of Amrum, with a breadth of 400 to 600 feet, trends as far as Steen point. At the mouth of the inlet there is a bar, with 3 feet water, but across which there is a narrow gut with 7 feet, and inside 8 feet, until midway, where the depth is only 4 feet, and close to the shore, off the house at Steen point, only 2 feet water. To enter the harbour leave the white buoy F. and the pole beacons on the port side. The lights in line lead into the harbour. *See* page 237. The harbour affords shelter against all winds, as the shallows to the N.E. and East of it dry at half tide.

WYK HARBOUR.—Has a depth of 9 feet, at ordinary high water; vessels drawing 7 to 8 feet may enter it and lie dry on the oaze bottom at low water. The pole beacons by which the entrance is pointed out should be kept on the port hand; and as the flood tide sweeps across the entrance, it is necessary in this case to keep close to the beacons; and during the ebb tide, to keep more to the northward to avoid being carried on the edges of the shallows. In Wyk, vessels may be provided with necessaries; and as there are three very good ship-yards, with two slips, even large vessels may be repaired, but they must unload at the anchorage outside to lighten them sufficiently to enter the harbour.

LIGHTS.—At the entrance of Wyk harbour on the eastern side of Föhr island, two *fixed* lights are shown from lanterns placed on poles at

19 and 15 feet respectively above the sea, and visible 4 miles, and when in line they lead in.

At Dagebüll, there are also two *fixed* lights, 87 yards apart, E.S.E. and W.N.W., on the pier, one 24 feet and the other 19 feet above the sea, showing *red* towards the north and white towards the west and south, visible from a distance of 8 miles. The lights in line lead into the harbour.

TIDES.—It is high water, full and change, at Wyk, Föhr island, at 1h. 50m., springs rise 8 feet; and at Amrum, at 0h. 30m., springs rise 9 feet.

ANCHORAGES in SCHMAL DEEP.—A short distance to the southward from buoy No. VII., with the house of Norderoog in one with Pellworm tower, a vessel may anchor in a convenient depth, according to her draught, (just inside the buoy the depth decreases to 2 fathoms,) on a sandy bottom, sheltered against winds from South, round east, to N.E.

Close to the east side of the Seesand, a little to the southward of its north-east spit, there is a tolerable anchorage in 6 or 7 fathoms, sand, sheltered against N.W. and N.N.W. winds, but it would be doubtful whether a vessel might be able to ride out a gale.

Off the south-east point of Amrum, the point bearing N. by W., there is shelter against winds from North to West, but not nearer to the edge of the shallow than in 3 fathoms, where the bottom is fine sand, and good holding-ground.

At buoy No. XII., and along the shallow as far as buoy No. XIV. at the N.W. point of Marschnak bank, there is good anchorage with south and easterly winds.

Life-boats.—There is a life-boat stationed at Wyk, Föhr island; also one at Amrum island.

The SUDER or SOUTH AUE turns easterly from the Seesand, between the Schweinsrücken and Alte Jap shoals, past Knudshörn shoal, and between the islands of Hooge and Nordmarsch, with a depth of 4 to 8 fathoms; farther in, the channel leads between the islands Gröde and Habell on the north, and Beens and Hamburger halligs on the south side, and giving access to the tidal harbours of Bondsiel and Süderdick. The north edge of the Knudshörn is marked by poles, there are also five black buoys, Nos. 1 to 5, on the south side, and two white buoys on the north side of the channel, and the sand stretching off from Beens hallig is marked by a chequered black and white buoy.

There is good anchorage in from 3¾ to 7 fathoms water, clay, near the shoal which extends off Hooge hallig with the mill bearing about S. by W. ¾ W.; there is also anchorage along the edge of the Knudshörn which is marked by pole beacons.

Bondsiel Harbour will admit vessels of 10 feet draught, but it is deficient in sea-walls and piers, and does not afford shelter against westerly gales and extraordinary high tides.

Süderdick, near Ockholm village, is a loch through which the superabundant water runs out, and will admit small craft at high water.

OLD SCHMAL DEEP leads from sea between the Tusch grunde and Engel sand, and the outermost of the extensive dry sands connected with Pellworm and Süderoog hallig. This inlet only admits vessels drawing 5 to 6 feet, on account of two shallows with 8 to 9 feet water on its bar, where the sea breaks even in moderate weather.

Buoys.—The outer buoy is conical, with a mast and ball, and painted with red and white stripes; the buoy lies in 13 feet water, with Pellworm old tower bearing E. by N., and Seesand beacon N. by E. ¼ E.; two can buoys also painted with red and white stripes mark the eastern edge of the Tusch grunde in 19½ feet water.

DIRECTIONS.—Outside of the shallows when the Seesand beacon bears N.E. by N. and Pellworm tower E. by N., steer for the latter to close the Outer beacon buoy on the bar, which may be approached by the lead; the edge of the bar is generally indicated by the rippling of the water. It is necessary to keep the lead quickly hove, as the depths diminish rapidly from 6 and 4 fathoms to 12 feet; when near the Outer buoy steer N. by E. ½ E. along the east side of the two inner buoys of the Tusch grunde; this course leads into the Schmal deep at No. V. beacon buoy, which should be left to the westward.

This inlet is of some consequence to the navigation between the Elbe and the West coast of Slesvig; it is commonly frequented by coasters, when the wind is south-westerly, more particularly as its course is direct N.N.E. and S.S.W., with a good breadth.

AMRUM BANK lies in the offing 8 miles from the western point of the island of Amrum. The depths on it are from 3¾ to 5 fathoms. It is 11 miles long, and from 2 to 3 in breadth, except at the north end, where it is only two-thirds of a mile across. The south end of the bank in 5 fathoms, lies W. by N. ¾ N. 14 miles from Seesand beacon, and its north end, lies W. ¾ N., 6 miles from Hörnum beacon.

The shelves on this bank consist of sand with pebbles and coarse sand, and to the northward of them fine grayish sand—the depth gradually increasing to 7 fathoms, 3 miles to the northward of the north end of the bank. To seaward the depth increases gradually to 10 and 12 fathoms, with a bottom of fine sand near the bank, then gray sand and oaze. Along its inner side the bank is steeper, deepening to 7 fathoms sand and oaze, and between the bank and Westbrandung shallows the bottom is sandy. Though this bank might be dangerous to vessels of large draught when it blows hard, yet in moderate weather it is of great use in making the Amrum inlets, for by the soundings, a course may be shaped from this bank to them with great certainty. During clear weather the sand downs on the south end of Sylt island are visible, as also those along the west side of Amrum, among which the Saddledown, and farther south the Grossedown, are conspicuous; Amrum lighthouse and mill may likewise be seen over the sand-downs. The shallowest water will be found on the bearings of N.W. ¾ W. from Seesand beacon; and S.W. by W. ¾ W. from Hörnum beacon; and W. by N. from Amrum lighthouse, distant 12 miles.

FORTRAPPEN DEEP is entered over a bar formed by the shallows off Amrum island. The channel is then along the inner side of the shallows, extending to the southward from Hörnum, and into Hörnum harbour or road. Both the bar and the channel are liable to change.

Buoys.—The entrance to Fortrappen deep is marked by a black beacon buoy in 13 feet water on the outer edge of the bar, with Amrum lighthouse bearing E. by N. ½ N. distant 4½ miles, and Hörnum beacon N.N.E. Three more black beacon buoys Nos. II., III., and IV. lie near the edge of the shoal and mark the eastern side of the channel; besides these buoys, two others with beacons Nos. Ia. and IIa., the former near the inner edge of the bar, point out the shoalest places along the east side of the channel off Kniepsand flat.

DIRECTIONS.—When Amrum island is seen bring the lighthouse to bear E. by N. ½ N., which will lead to the best water on the bar and to No. 1 black beacon buoy, keep Amrum mill open to the southward of the Saddledown until Hörnum beacon bears N.N.E. to pass to the southward of a 5 feet patch on the bar, then steer for the Beacon passing to the westward of No. 1 buoy and continue the same N.N.E. course so as to pass to the westward of No. 1a. buoy, then steer a little to the westward of North so as to pass on the same side of No. II. black buoy. When No. Ia. buoy is passed and you are inside the bar, the water deepens to 6 fathoms; from No. II. buoy the channel trends N.E. by N. in the direction of the inner side of the south point of Hörnum, in a depth of 6 to 9 fathoms, and inside the North knob there are even 12 fathoms: the inner side of all the shoals is steep-to. The deepest water over the bar will be found from the direction of Land deep, when Seesand beacon bears S.E. ½ E. about 4¼ miles, and Hörnum beacon N.N.E.; steer up for the latter and follow the directions given.

Caution.—In a gale, and the wind scant, this inlet should never be attempted, for from the heavy sea and the tide, particularly with a north-west gale, it is impossible to come in or out without risking vessel and life. Under all circumstances the lead must be carefully attended to when approaching the bar, as the depths decrease suddenly from 3¾ fathoms to 2 fathoms.

Anchorage.—Close inside Hörnum point a vessel may anchor in Hörnum road in 4 to 10 fathoms, 2 to 3 cables from the beach, and be well sheltered, except with gales from S.S.W. and S.W., which occasion a rough sea.

The continuation inwards of Fortrappen deep, from abreast of Hörnum point, is called Hörnum deep; it leads E. by N. ¾ N. and then E. ½ N., with a depth of about 6 to 8 fathoms, to the northward of the Liin sand, on which stand two steeple-beacons with brooms; from thence the channel inclines N.E. towards Föhrer Schulter, with a depth of 3 fathoms 2 miles from the shore of Föhr, where there is a gully with 4 to 5 fathoms water, but only a cable wide, and on either side dry shallows which are steep-to.

KNIEP HARBOUR.—The Kniep sand is connected with the south-west side of Amrum; it is generally dry, and extends, with a narrow spit to the northward, along the island a mile to the northward of the west point. Inside this sand there is a small harbour, with 4 to 6 feet water, where vessels may ride in safety with all winds as long as the water does not rise over the Kniep sand, which occurs only with westerly gales and extraordinary high spring tides; in some parts of this harbour the bottom is rock and seaweed. It has two entrances, the westernmost leading in from Fortrappen deep a quarter of a mile below No. III. buoy, and abreast of the Holt knobs, passing close round northward of Kniep sand, and between it and a sand partly dry at low water to the northward of it. The depth by this inlet is 6 feet.

In entering this harbour round the dry point of Kniep sand, keep along its inner side into the harbour, to avoid a short reef extending from the west point of Amrum island, as well as a bank dry at low water, and close to the northward of the point; the deepest water is found along the Kniep sand. The northern inlet, with a depth of 9 feet, likewise branches off from Fortrappen deep; and when the high sand-down on the north end of Amrum, called North hill, bears S.S.E. it should be steered for, passing a black buoy, until within a cable's length from the beach; between the latter and the dry sand to the westward, and outside of the reef and of the bank at the west point of the island.

SYLT ISLAND.—From seaward, the land of List point, the northern point of Sylt island, appears low; but close to the southward of the point the Albue hills rise to the height of 115 feet. From the northward, these hills appear like three hummocks equidistant from each other, and are visible at 12 miles. By these hills the island is easily distinguished from Romö, on which the tower of St. Clemens church is very conspicuous. The whole of the 20 miles of the long western shore of Sylt is clean, and the only danger in approaching it is when a lee shore: it consists of the usual white sand-downs, except a single remarkable cliff called the Röde or Red klif, nearly 6 miles to the southward of the lighthouses on the northern part of the island, and affords an excellent mark to make the land and the Lister deep. It is not only the highest of the sand-downs on the coast, but the whole of its lower part, rising perpendicularly from the sea, consists of a solid mass of dark hue, being a ferruginous coarse sand and clay, and of a different appearance from all the rest of the downs.

This remarkable cliff may be discerned at 12 to 16 miles, when in 9 to 10 fathoms water; and during the forenoon, if the sun be not then shining, it has a dark hue, whereas in the afternoon it has a yellowish tint. Abreast the cliff, about 4 miles off, the bottom is red sand, therefore, during the night or in thick weather, and coming from the southward, when the soundings change to red sand, instead of fine sand more or less mixed with oaze, it shows the vessel is in the vicinity of Röde klif.

From the shelves, to the northward of Röde klif, the west side of Sylt island, as far south as Hörnum point, its south extreme, is clean, with a depth of 4 fathoms a short distance from the shore, and gradually increasing to 10 and 12 fathoms outwards. From Hörnum point shallows, which dry at low water, and in some places even at half tide, project 8 miles in a S.W. ½ S. direction; the breadth of these shallows in the middle is nearly 3 miles, the depth gradually increasing outward; they are called the Hörnum sands, Holt knobs, and Jungnamen; between the two latter is a passage for small coasters from the west into Fortrappen, on a bearing of E. ½ S. of Norddorf staff on Amrum island, having from 2½ to 6 fathoms of water in it.

Beacons.—To distinguish Hörnum point from the uniform appearance of the adjacent coast, and also to warn vessels of the dangerous shoals which extend to the south-westward from it, a beacon is erected on a sand-down near the south point of Sylt island. The beacon is of a circular form, and its summit is 104 feet above the sea; at its base there is a sheltered place for shipwrecked mariners, who will find benches on which they can repose, and cases containing bread and water. About a mile north-east of it, on another sand hill, is a smaller erection.

At the north end of the island there is a beacon 88 feet above the sea, on Albodal Ellenbogen sand-down.

LIGHTS.—In order to render the Lister deep and its sheltered anchorage, the only secure one on this dangerous coast, accessible by night as well as by day, two lighthouses, each exhibiting a *fixed* light, were established on Albue head at the north end of Sylt island. The lights are distinguished from each other by the outer or westernmost showing a small *red* sector towards the entrance, and placed at an elevation of 64 feet above the level of high water. The inner light is 72 feet above the same level, and both are visible all round the horizon in clear weather at the respective distances of 10 and 12 miles; but in approaching from the southward, along the western shore of Sylt island, the inner light will occasionally be intercepted by the cliffs until the lights are nearly in line.

The lighthouses are circular and of iron, painted white, with red tops; the westernmost is 27 feet and the easternmost 44 feet in height; they are 1¼ miles apart, in a S.E. by E. ¾ E. and N.W. by W. ¾ W. direction, and when in line lead over the bar in a depth of 16 feet at low water.

Bröns Hill.—A lighthouse also stands on Röde klif near Bröns hill, in the village of Kamp, so as to be visible over Röde klif; and is consequently a conspicuous object on the coast. It is a round yellow tower, 123 feet high, and exhibits, at an elevation of 205 feet above high water, a *fixed* white light of the first order, varied every *fourth minute* by a bright *flash*, which in clear weather is visible at 20 miles; in the direction of Lister deep, between the bearings of S. by W. ¼ W. and S.W. ½ W. the light is faintly coloured *red.*

Munkmarsch.—A *fixed* white harbour light is exhibited at Munkmarsch on the east side of Sylt island, from the south side of the landing pier, the light is visible in clear weather for 6 miles.

A second light of the same description will be exhibited on the pier—but to the southward of the other—when the new channel which is being formed to lead to the harbour is completed. The two lights in line will lead through the channel.

TIDES.—It is high water, full and change, at Lister deep Fairway buoy, at 0h. 30m., springs rise 5¼ feet; and at Lister road, at 2h. 0m., springs rise 6¼ feet.

Life-boats.—There are three life-boat stations on Sylt island. One at the south end at Rantum; one at Westerland, near the middle of the island; and the third at Kampen, to the north of the lighthouse.

RODE KLIF SAND lies in the offing between lat. 55° 8′ N. and 55° 15½′ N., abreast of the islands Manö and Romö. This sand, however dangerous to large ships in a heavy sea, is an important and useful guide in making the inlets between List, the north part of Sylt, and Fanö island; the depth on it is 4 to 6 fathoms, with coarse, yellowish-brown sand on the west side, but on the east side, where the shoalest parts are, fine sand of the same colour. Between its eastern side, and the outer shallows from the shore, the bottom is likewise fine yellow-brown sand, and as the depth is nearly the same, the bank may be considered as part of the shallow.

On its south-west side the bank in some places slopes abruptly, and the bottom outside it is dark sand, with oaze, frequently mixed with shells. Its shoalest part bears N.N.W. ¾ W. about 12 miles from the north end of Sylt island, page 244.

ROMÖ ISLAND, to the north-east of Sylt island, and separated from it by Lister deep, is 7 miles long N.N.E. and S.S.W., and 2 miles wide.

Beacon.—At S.W. ½ W. three-quarters of a mile from St. Clemens church, Romö, is the Königs beacon.

HAV SAND.—Off the south-west side of Romö, a shallow called the Hav sand, the greatest part of which is dry at ordinary high water extends 1¾ miles towards Albue (elbow) point, on Sylt. The outermost part of this shallow is a flat with less than 2 feet water, which slopes abruptly into the deep; the southern part of the dry sand is marked by a white buoy D lying in 21 feet water, and beacon poles.

LAMMEL SHOAL.—Close outside this sand is the Lammel (Lamb), composed of several long shoals and patches, with a depth of 2 to 4 feet, and one spot uncovers at low water. These shoals extend 2½ miles to the westward of the shore abreast of St. Clemens church, and incline obliquely towards the south-west side of the Hav sand; the south-west point is marked by a white buoy, C., carrying a ball on a black pole.

The RÜST GROUND, outside the Lammel, lies 6 or 7 miles to the West and W. by S. from Romö, with irregular depths. The shoalest place on the Rüst is the south-west side of the shallow forming the northern side of Lister deep; it consists of hard sand, and has a depth of about 2 fathoms for 2 miles east and west, its shoalest patch being on its north-east end. The whole of the south side of the Rüst ground may be approached by the lead; and on its west side, which inclines in a southerly direction, and forms the bar at the entrance of Saltsand deep, the depths increase to 13, 14, and 15 feet; the south side is marked by two white nun buoys, A. within the edge in 2½ fathoms, B. outside in 5 fathoms, about one mile N. by W. from the western lighthouse of Sylt.

SALTSAND.—To the southward of the above shoal is the Saltsand, composed of very loose sand, extending nearly 3 miles, about W. by N. from Albue point, within the 3-fathoms line, and having 2 to 15 feet water over it. On the northern edge of the sand are the shoalest patches close to the deep, on which in stormy weather the sea breaks heavily, and where the depth increases suddenly to 7, 8, and 10 fathoms; three black spire buoys, Nos. I., II., and III., bound the northern edge.

Rog Deep, or North Inlet, leads from sea over the flat between the Lammel and the Rüst. To cross the narrowest part, bring

St. Clemens church, on Romö, to bear E. ½ S., and when in 3½ fathoms water steer S.E. by S., which course leads in not less than 2¼ fathoms at low water. If, from circumstances, forced to take this entrance, a vessel will be to the eastward of the Rüst when Röde klif is shut in by Albue the north-west point; from thence steer directly for the anchorage at List, taking care not to come too near the Hav sand ridges. This can no longer be considered as a channel, being but the narrowest part of the shallow flat projecting from the shore; but under certain circumstances the directions may be of service to vessels of light draught.

SALTSAND DEEP, between Saltsand and the Rüst, is the best inlet to Lister deep; and from having a great depth inside, and 18 to 25 feet on the bar, this channel, which is buoyed, is of great consequence to vessels caught on a lee shore on this dangerous coast, by affording access to the sheltered and safe anchorage at List, and Romö harbour to the eastward of Albue point.

Land Deep, between the Saltsand and the shore of Sylt, has a depth of 12 to 15 feet, until near Albue point, where, on the flat that connects the Saltsand to the island there are only 9 feet water, and as the channel here is very narrow, it is only practicable for small vessels. It is proposed to buoy the channel with a black buoy on its east side at the west point of the sandbank extending off from Sylt, a white buoy on its west side at the south-east side of the Saltsand, and a black and white buoy within, at the east point of the Saltsand leading into Lister deep. Whether inward or outward bound, take care to avoid two small shelves, with 6 to 7 feet water on them, to the northward of Röde klif, and extending half a mile W.N.W. off shore.

LISTER DEEP.—The narrowest part of the Lister deep within the bar, beween the Rüst and the Saltsand, is one third of a mile wide, and varying in depth from less than 4 fathoms to 8 fathoms near the Saltsand, and to 15 fathoms near Hav sand. Towards the Rüst the depth decreases gradually, and over the bar from No. I. buoy outwards, a distance of 1¼ miles, the depths vary from 18 to 24 feet.

Buoys.—A conspicuous Fairway buoy surmounted with a cone top, point downwards, is moored a little north of the entrance in 5 fathoms W.N.W. 3½ miles from the lower lighthouse, open north of the upper, and N. ½ E. 7 miles from Röde lighthouse. Besides the buoys before named are five black, Nos. IV. to VIII., on the north edge of the Jordsand, leading to Romö harbour, and one chequered buoy on the north-west spit, and seven white ones on the west and south sides of the Jordsand, leading up the Höyer deep; the numbers and letters on them are continued from the outside. Where other buoys are found in the Ley, or deeps, up from the Lister, their colours indicate their position.

DIRECTIONS.—Coming from the southward, with the intention of entering Lister deep, the intervening sand-downs may prevent the lighthouses from being seen, therefore keep well off the shoals in 5½ to 7 fathoms water, until so far advanced to the northward as to have the lighthouses visible and in one, bearing S.E. by E. ¾ E.: if the weather is sufficiently clear, Ballum church tower will then be seen, standing a little to the southward of the southernmost house in Romö. When Röde lighthouse bears about S. by E. steer for the entrance with the upper light open a little to the southward or the lower, the deepest water over the bar now being south, about half a mile of the line of lights. Pass on either side of the Fairway buoy, and between the black and white ones No. I. and A ; when on a south-south-west bearing of Röde lighthouse, the shallowest part of the bar will have been passed and the deep entered.

After passing these buoys, bring the lighthouses in a line, and steer up for No. II. buoy on the northern edge of the Saltsand; when this is passed, the course must be altered to E. by S., past No. III. buoy, until abreast of the outer lighthouse, so as to clear the Saltsand; then keep one point more to the southward, or E.S.E. along the shoal extending a short distance off from the land between the lighthouses.

On passing Albue point, the villages Morsum and Keitum will first be visible over Sandspierling point, then Braderup, and immediately after, the easternmost houses in Kamp village will open out, when haul to the southward, being then to the eastward of the Barling sand, on which there are 20 feet water, and steer into Lister road. Large vessels should moor in the direction of the ebb and flood stream, about N.E. and S.W.

The Jordsand flat must be avoided, it is steep-to, and marked as before mentioned by black buoys on the north side, and white buoys on the west and south, except the one on the north-west spit towards Romö inlet, which is black and white checkered, and may be approached by the lead: the Höntje or Hunningen sand, to the south-west of the Jordsand, is marked on its north edge by a striped black and white buoy; and the shore shallow between Albue and Sandspierling points, both of which are steep-to. Small craft may keep close to Albue point when rounding it, by attention to the lead, and may anchor on the flat between that point and Sandspierling.

At Night, having made Röde klif light don't go into less than 6 or 8 fathoms water until Lister deep lights are in line, these kept S.E. by E. ¾ E. will lead over the bar in 16 feet water, when the light on Bröns hill or Röde klif changes to *red* bearing S. by W. ¼ W. you will be between No. I. and A. buoys, and when the light bears S.S.W. you will be up to the inner black buoy No. II., to which a good berth must be given. Proceed on an E. by S. course, through Lister deep, to the northward of this and No. III. buoy, and along the shallow in 7, 8, and 9 fathoms, keeping the lead going until abreast the outer light standing on Ostindie point (East Indiaman point), bearing S. by W.; then steer more southerly, about E.S.E. along the shore shallow, passing the inner light at the same distance as the outer one, until the inner light bears S.S.W., then steer still more southerly, or about S.E. past Albuhuk, and when the light on Röde klif appears white, and bearing about S.W. by W., which now again becomes constantly visible, steer for it to the south-westward and anchor in List road in 6 fathoms, sandy bottom.

Caution.—With a scant or contrary wind it is necessary, whether inward or outward bound, to pay great attention to the setting of the tide, and during the ebb stream not to come too near the Saltsand or the Rüst, as that stream sweeps obliquely across these shoals with great rapidity, but the flood runs from them on both sides of the channel; the rippling on their inner sides is visible, and during boisterous weather from the westward, the surf on the shoals indicates the channel. Farther in, on the contrary, both flood and ebb run along the Albue shore, and there, as also midway in the deep, between the Rüst and Saltsand, it follows the direction of the channel. As Lister bar is liable to alterations in position and depth, it is advisable, if practicable, for strangers to procure the services of a pilot.

Romö Harbour.—When in Lister deep, and List mill is seen to the eastward of Albue point, a vessel may steer East until near the Hav sand, which is steep-to; and then stand close along this sand, in 5 to 8 fathoms, till she enters the Romö deep, the sides of which are marked by the black buoys placed on the north edge of Jordsand flat, and white buoy D, with the beacon poles on the Hav sand.

By following the sand, between the stakes and buoys, the course changes by degrees more northerly, until abreast of No. VIII. black buoy off the south end of Romö, where a vessel may anchor in 4½ fathoms. Small craft may enter the bay or harbour, but they will be left dry at low water. The breadth of the channel up to the anchorage off the signal post is a third of a mile, and the depth from 10 to 6 fathoms.

LIGHTS.—Two *fixed* white lights are exhibited at Höyer, the northern from a post at Höyer water-gate, and the southern from an iron structure at Friedrichen Koog, 1,094 yards from the northern. The lights are visible from 6 to 8 miles, and kept in line will lead through the channel from Höyer-deep to Höyer water-gate.

HÖYER INLET.—The chimneys of the northernmost house on List in one, is the leading mark for the channel to Höyer between the Jordsand flat and the Höntje (Hunningen) sand, with a depth of 6 to 10 fathoms; and on either side shallows, which are steep-to, until past the small island of Jordsand. To guard against the west side of the Jordsand, four white buoys marked Höyer, D, E, F, and G, are placed in from 3½ to 2½ fathoms; and farther in, at the south-west side of the sand, there is a white buoy, Höyer H, in 2 fathoms; and finally two white buoys, Höyer J, and K, are placed in 3½ and 2 fathoms on the south side of the shoal extending south from the Jordsand.

The south-west side of the inlet is formed by the Höntje and Robsand sands; at the north spit of the Höntje, as before stated, a striped black and white buoy lies in 3 fathoms, two black buoys, Nos. IV. and V., mark the north side of the Höntje, and the Robsand is marked by a black buoy, No. VI., lying off the white buoy K. Farther in, two black buoys, Nos. VII. and VIII., are on the north side of Hestensand, and as in the canal leading to Höyer, poles are placed on the south-west side of the inlet, in which there are only 2 feet water at a mile from Höyer. To the southward of Jordsand there is anchorage in 6 to 7 fathoms.

LISTER LEY.—This small inlet is a continuation to the southward of Lister deep, in the direction of Naes point, between Höntje sand, the north-west side of which is dry at half tide and remarkably steep-to from 10 fathoms, and Leghörn sand which is dry at low water, and is connected with the island of Sylt. The depth in the Lister ley is 5 to 7 fathoms, and it affords good anchorage for vessels of any size, and shelter from all winds.

Buoys.—At the north-west end of the Hönjte flat there are two white buoys, the northernmost D lying in 26 feet, and the other E carrying a basket, in 17 feet water, with List mill bearing N. by E. 1¼ miles. Farther south, on the edge of Leghörn sand, are two black buoys, Nos. IV. and V., on the north point of Batter sand and on the west side of the Ley there is a black and white buoy with a mast and ball, lying in 14 feet water; and one mile more to the southward, there is a black buoy in 16 feet water on the west side of the channel.

Pander Deep, leads out of Lister ley between the Leghörn and Butter sands, with 4 to 5 fathoms water for 2 miles up to its termination at about 2 miles from Munkmarsch; it is marked by two white buoys, F, and G, on the north side of the Middle and Rauling sands, and by a black buoy, No. VI., in 16 feet water, on the south-east side of Leghörn sand.

Juvre Deep, 10 miles north of Lister deep, leads from the sea between the Chore sands on the north side, and the Bollerd and Romö flat on the south side, and branches off into two channels near the spit of Reisby shallow, where the inlet has a depth of 5 to 8 fathoms; but the bar on the outer shallows, on which there is a dangerous surf during westerly gales, renders it difficult to enter, more especially as it is not buoyed.*

Directions.—To enter this inlet when in 4 fathoms outside the shallows, with Ribe cathedral in line with the south end of Manö E. ¾ N. northerly, and St. Clemens church, which is low and just visible between the sand-downs on Romö, S.S.E. ¾ E., steer E. by N. ½ N. in the direction of Manö mill, keeping the cathedral a little overlapping the south side of Manö; and when Sönderhoe mill comes in line with the southern Sönderhoe beacon, page 253, on the south end of Fanö, the vessel will be in 8 feet water, close outside the shallows. The lead, if hove quickly, will indicate when the vessel is in the channel, which is very narrow, and has a depth of 6 to 7 feet; and when Sönderhoe mill is midway between the beacons, she will be in 4 to 6 fathoms water and inside the bar. Thence the channel trends S.E. by S. for two miles between the Bollerd, which dries at low water, and the Chore sand, which is uncovered even at high water, in 5 to 8 fathoms, with shallows steep-to on either side, but it is clearest along its south side.

Near the Chore sand will be seen the Reisby shallow, which is connected with the shore, and stretches to a distance of 5 miles from it abreast Reisby village. It is dry at low water; its north side slopes gradually, but the south side is steep to, and off its western side, which is dry at low water, a spit of the sand extends a mile in the direction of W. by S. ¼ S., with 9 to 12 feet water. This point named Reisby steert divides the channel into two parts. When soundings are obtained off this shallow, steer northerly or southerly so as to follow the deep-water channel. With Ribe cathedral just open to the northward of West Vedsted church, a vessel may stand into 2, 3, and 4 fathoms along the shallow on the east side of Manö, which is steep-to, and find good anchorage, sheltered against all winds, when the southern beacon on Sönderhoe is in line with the north end of Manö.

From the spit of Reisby shallow a vessel may steer S.E. by E. ½ E. nearly in the direction of Brönæs church, in 5 to 6 fathoms, with steep shallows on either side; when the innermost point of Romö bears S. by W. ¾ W., the channel trends S.S.E., and she can anchor two-thirds of a mile from the north-east point of Romö, in 12 to 15 feet water, bluish clay, close to the beacons standing on the edge of the shallow, which is steep-to. The boundary which separates Germany from Denmark is about half a mile to the southward of Vedsted.

Draget Inlet.—The inlet to Ribe, called the Draget, leads from the sea, 1½ miles north of the Juvre deep, between the Yder Knude and the

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* *See* Admiralty chart, North sea, No. 2,182*b*; scale, *m* = 0·1 of an inch.

Flakstiert sand on the north side, and the Chore sand on the south side, to Manö flat, along which it runs E. by N. ¾ N., and joins the Knude deep between the easternmost spit of the Flakstiert and the north-western spit of Manö flat; but as the depth in this channel on the shelves between the Flakstiert and Chore sand, is only 6 to 8 feet, it is only practicable to fishing vessels, and such as are intimate with the frequently changing shoals; and attention is also required to beware of the blind inlets inside the two sand-spits formed on the south side of the Flakstiert.

FANÖ.—The shallow along the west side of Fanö gradually slopes to the depth of 4 fathoms between the Graa deep and the south point of the island, off which shoals extend towards the S.W. to a distance of 2½ miles. The south end of the island is surrounded by the shoals, Kiel sand, Meyers sand, Indre Knude (the inner knot), and the Gallie reef, all partly dry till high water.

Beacons.*—On the sand-downs at Sönderhoe, the south end of Fanö, stand two pyramidical beacons, 1,000 yards E.N.E. and W.S.W. from each other, the northern is surmounted by a square with a triangular top and a vane above, 47 feet in height, and 82 feet above the sea; the western beacon is also surmounted by a square, but a triangular notch is cut out in the upper part, it is 39 feet high, and 72 feet above the sea.

On the south side of Peter Meyers sand there are two smaller beacons with framework tops, E. ½ S. and W. ½ N. 550 yards apart, and each 30 feet high. Fanö beacons on the north end of Fanö are 1,500 yards in an E. ¼ S. and W. ¼ N. direction from each other. The eastern, called the Mill beacon, has two arms in the form of a St. Andrew's cross and is surmounted by a rectangular grating; the beacon is 60 feet high and is painted red. The western beacon is a mast with supports, having on the top a red square, facing the channel, with a red cross above and below; the beacon is 42 feet high, and when in line with the Mill beacon is a leading mark for the bar. The position of this beacon is changed as the alterations in the bar may require.

KNUDE DEEP.—To enter Knude deep, the main inlet southward of Fanö. The channel, which is liable to constant changes, passes between Meyers sand to the north and the Flakstiert to the south, then between the Kiel sand, and the Peelrevel, and Laeggen. Do not approach the outer shallows within the depth of 4 fathoms, before Sönderhoe beacons are seen, which, brought in line bearing E.N.E., is the leading mark until Meyers beacons are in one, E. ½ S. The outer black, oval, buoy, with a ball, will then be seen. It at present lies in 13 feet water on the outside of the bar, between the shallows of the Meyers sand and the Yder Knude

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* *See* drawings on Admiralty chart, No. 1,887.

(outer knot), with the eastern beacon on Sönderhoe visible, the height of a beacon, to the northward of the western beacon; this latter shoal carries only 6 feet and its depth is gradually decreasing: vessels working in this deep should therefore attend to the beacons on the Meyers sand, and not neglect the lead. The depth on the bar is 8 feet. When at the outer buoy keep mid-channel, with the beacons on the sand in one. Besides the outer buoy, a black buoy, No. 1, in 8 feet water, lies E.S.E. 1½ miles from the outer buoy; and E.S.E. from No. 1, lies another black buoy in 5½ fathoms, at the western spit of the Flackstiert; and at the north point of this stiert, in 15 feet, lies a third black buoy, No. 3, E.S.E. from No. 2. To the northward, a white buoy A. lies in 8½ feet water, on the bar, E. ¼ N. from the floating beacon buoy; and B., white, in 16 feet on the south-west spit of Meyers sand, E. ½ S. from A.

Having passed these buoys, the depth is 13 to 15 feet, and the course E. by S. easterly directly for Ribe cathedral, which is visible in clear weather, and conspicuous by its high and square tower, with a flat top. The farther in, the greater the depth, from 4 to 7 fathoms, and the shallows on both sides are steep-to, particularly at the Meyers sand, the edge of which is clean, whereas on the south side a ridge of sand extends from the Flackstiert, which should be avoided when working in.

When Sönderhoe mill is in line with the northern beacon on the island, the channel trends E. ¼ N. and E. by N. ¼ N., towards the steep south-east spit of the Kiel sand; and then along it in a N. by E. ¾ E. and N.N.E. ¼ E. direction; the channel is pointed out by pole beacons, with brooms, along the Kiel sand, which should be passed close, on account of a spit of sand, with 4 feet water, extending to the S.W. from the Læggen bank, on the eastern side of the channel. On this spit, a small black buoy, No. 5, carrying a basket, lies in 5 feet water, with Ribe church S.E. by E. ¾ E.; and on the north edge of the Peelrevel sand, in the same depth, lies No. 4, black, with a basket, from which Ribe church bears E. by S. ¾ S. In making the channel along the east side of the Kiel sand, these buoys are to be left on the starboard hand. Farther to the northward in the channel the depth decreases, until at the beacon, placed on the north-eastern spit of the Kiel sand, with Sönderhoe mill bearing W. ½ N., and Manö mill S.S.W. For such vessels as are able to enter the Knude deep, the channel affords good anchorage and shelter off the Kiel sand.

From the north-east point of the Kiel sand, the Knude deep runs N.E. ¾ E., nearly in the direction of Darum church, between the Pender and Læggen sands, with a gradually decreasing depth from 17 to one foot, and terminates a mile from the shore, abreast of Darum.

Ribe Channel.—At the south-east point of the Kiel sand Ribe channel branches off from the Knude deep in an E. ½ S. direction, with Fardrup church nearly in one with Tanderup village, with a depth of 18 to 8 feet. The rivulet beyond only allows small craft drawing 3 to 4 feet to pass up to the town of Ribe, larger vessels being obliged to remain nearly 4 miles from the shore, and to unload or load by boats or prams.

Sönderhoe Road.—From Kielsand point beacon to Sönderhoe road, a distance of two-thirds of a mile, the course is N.W. by N., changing gradually to W. by S. across the shallow. This channel is pointed out by pole beacons, and only admits vessels drawing 4 to 5 feet at an ordinary high water. When this shallow part of the channel is passed, the course is W. by S. ⅓ S. for Sönderhoe southern beacon, between the Pender, Hornvig, and Fuglsang shoals, on the north side, and the Kiel sand on the south side; towards the beacon on the north-west point of the Kiel sand, where the depth increases to 4 and 5 fathoms. Abreast of the eastern point of Fanö, in 4 fathoms water, as also along the south-east side of Sönderhoe, between the shallow from the shore and the Kiel sand, there is good anchorage close to the shore, except during a S. W. gale, which causes much sea and surf on the beach, and covers the Meyers sand at high water.

Gallie Deep and South-west deep, formerly two passages for boats leading across the bar in 5 to 6 feet water to Sönderhoe road, have united and formed an inlet named South-west deep. It has about 3 feet on the bar, and has become of importance to Sönderhoe, the channel to the northward of the Kiel sand being almost filled up, and with an easterly wind and ebb tide, is not practicable for the galeasses of Sonderhöe, while those boats find no difficulty in passing through the South-west deep; for their guidance a buoy painted black and white is laid inside the bar in 5 feet water, with Manö mill visible about 20 yards to the eastward of the eastern beacon on Meyers sand.

GRAA DEEP, the northernmost of the inlets on this coast, and 10 miles north of Knude deep, lies between Fanö island and Skallingen, and leads to the new port of Esbjerg, and to the snug little harbour of Fanö Loe, on the noth-east side of Fanö; and northward on to the loading-place Hjerting, where vessels drawing 9 feet may lie afloat at low water; and still farther to the northward to Varde rivulet, admitting small craft drawing 3 to 4 feet.

Caution in consequence of the changing nature of the sands strangers shonld not enter Graa deep, Gallie deep, nor Knude deep without a pilot.

LIGHTS.—On Seding strand are two *fixed* leading lights for Graa deep, which can be seen through an arc of 9 degrees on either side of an E. by N. ¾ N. bearing. The western lighthouse is a wooden building 35 feet high, and the light is shown at an elevation of 41 feet above the sea, and is visible for 11 miles in clear weather. The eastern lighthouse is a round iron tower, painted red and white, and bears E. by N. ¾ N. 700 yards from the western one, the light is 78 feet above high water, and can be seen in clear weather for 14 miles.

Esbjerg harbour leading lights are two white *fixed* lights, visible through an arc of 9 degrees on either side of a S.E. ¼ S. bearing. The northern light which is 26 feet above the sea, is shown from a white wooden building on the west jetty; the southern lighthouse on the eastern jetty is also of wood, but painted red, and 36 feet high. The lighthouses are S.E. ¼ S. and N.W. ¼ N. 315 yards from each other. A *fixed red* light, elevated 17 feet above high water, is exhibited from the head of the North mole at Esbjerg harbour, and is visible for 3 miles.

Beacons and Buoys.—Beides the two beacons on the north end of Fanö island, already mentioned page 253, there are three others on the south-east point of the Skallingen; the south-west or A. beacon is a large white mast with supports, 28 feet high; the north-east or B. beacon is 700 yards N.N.E. ¾ E. from the former, it is a mast 32 feet high, painted with red and white horizontal bands, having a square, with its point upwards on the summit; the middle (C.) beacon is a mast 32 feet high, surmounted with a red triangle point down, it stands 400 yards N. by E. ¼ E. from the south-west beacon, and 330 yards W. ¾ S. from the north-east beacon. They with the buoys are to lead in the deepest channel into the Graa deep, which is, however, liable to frequent changes, and the marks shifted accordingly.

Outside the bar, in about 5 fathoms, is a black nun buoy with a red staff and ball; it at present lies on a W. ¼ N. bearing from or in line with the north Fanö beacons, the nearest about 5 miles distant, and about W. ¼ S. from the Skallingen beacons. Within this Fairway buoy, and outside the three fathom line, lies white buoy A on the north side of the channel, and black No. 1 on the south side, bearing respectively from the former East, and E. by S. ½ S., about 1¼ miles distant. Between these two buoys is the main channel over the bar, and the course up to abreast of Skallingen point is E. ¾ N.; there are several buoys and floating beacons on each side, which are shifted as the sands alter.

DIRECTIONS.—The depth over the bar, on which the sea breaks with the least wind, is from 6 to 12 feet, and within, at about 1¾ miles from No. 1 buoy, the depth increases to 5 and 8 fathoms.

The first half of the flood is said to run out through the channel, it will therefore be necessary to make proper allowance in steering in between the buoys.

The Sandende, and also the Sörens Jessens sand, extend from a half to two-thirds of a mile, and are dry at half flood. The depth in this inlet is from 4 to 7 fathoms, and the shallows on either side are steep-to. When working in, care should be taken to avoid a ridge of sand, extending S.W. ½ W., nearly half a mile from the south-east point of Sælhage, at the end of which there is a white buoy.

South Channel.—Nearly 3½ miles S.E. by S. of the Fairway buoy is a white buoy surmounted by a staff and ball; it is marked *Syd Graadyb*, and lies S.W. ¼ W. 4 miles from the western Fanö beacon, in about 3 fathoms of water; two white buoys are placed on the flat, indicating the best water in that direction into the Graa deep. As there is little more than 6 feet in some places, and the channel intricate, none but well acquainted coasters should attempt it. The tides set across the channel.

Hjerting Channel is marked by buoys and beacons. The depth in this inlet is 3 to 5 fathoms, both sides being steep-to, particularly at the Topsand. Half a mile to the southward of Hjerting a ridge of sand, extending from thence to abreast of Hjerting, divides the inlet into two narrow channels, each of which is 138 yards wide. On this ridge there are 7 feet, but on its north-east spit only 6 feet water. The best anchorage is to the northward of the ridge, where there is a breadth of nearly 1½ cables across the channel, in 9 to 12 feet water, sand and oaze, sheltered from all winds, except those from south and south-west, which during the ebb tide cause some sea. A little to the northward of Hjerting a wooden pier, 220 yards in length, has been erected, at the outer end of which there are 11 feet at ordinary low water. Hjerting is the sea-port of Varde, and exports a great many cattle, and the produce of Jutland to England.

Esbjerg is a new port on the coast of Jutland opposite the north-east end of Fanö. It is formed by two jetties and is dredged to a depth of 12 feet at high water. The channel leading to Esbjerg is marked by two white buoys with broom beacons, and a black buoy before the entrance of the port.

To proceed through the Inner or south-east branch of Graa deep—from the small beacons on the Sandende steer mid-channel, S.E. ½ E., between the shallow from the shore and the Meilsand, which dries at half ebb half a mile off: the third hillock from the point at Bavenhill in one with the southern house in Strandby village is the leading mark for this inlet, until Fanö mills bear S. by W. ¾ W., each of them showing in the hollows between the sand-downs, when the inlet inclines S. ¾ E., with a depth of 4 to 6 fathoms; the Meilsand is steep-to. When to the southward of the Meilsand, keep two single houses to the eastward of Hjerting, open of the cliff to the southward of the said houses. In this inlet there is good anchorage, according to the wind, either on the flat between Strandby and Esbjerg, or off the north-east point of Fanö. The inlet continues between the Næsö Jord and the shore shallow, carrying a depth of 2 fathoms past Tierreborg; a short distance farther south it dries at low water.

Fanö harbour beacon in one with the middle of the ferry-house is the leading mark to Fanö Loe, leaving the white buoy on the north end of the Næsö Jord to the eastward, towards which harbour the inlet with a depth of 4 to 6 feet bends south-westerly between the Næsö Jord, on which there are pole beacons, and the shallow from the island, close along the latter, until past the mills. As off the point, on which the beacon stands, a short sand-ridge with 2½ feet water extends towards the channel, a vessel should keep close to the inner side of the Næsö Jord. In the harbour the bottom is oaze, and vessels drawing 4 feet remain afloat at low water abreast the ferry house.

By night.—Röde klif light having been seen, which should be made by vessels bound to Graa deep, approach the coast so as to bring the two lights at Seding in line bearing E. by N. ¾ N., and keep them so to cross the bar and lead up the deep until the two lights at Esbjerg are nearly in line, then steer a little to the southward to bring the latter lights in line and to clear Lithoe sand, taking care to allow for the set of the tides. When Esbjerg lights are in line steer up with them so until the west or lower light is hidden, when the course should be altered for the anchorage.

TIDES.—It is high water at full and change, at Sönderhoe, at 2h. 22m., springs rise 5½ feet; and at Hjerting, at 2h. 45m., springs rise 4¾ feet.

Lifeboat.—There is a lifeboat and rocket apparatus stationed to the southward of Nordby on Fanö island.

Telegraphs.—There is telegraphic communication between Sandby and Fanö, the station is distinguished by two red and white beacons near the old ferry house. There is another station about 2 miles to the south-west of the most southern mill at Nordby. This cable is connected with Calais.

HORN REEFS.*—The outer 5-fathom line of soundings around these dangerous reefs extends from a distance of about 20 miles W.N.W. from Blaavand point; to the southward for about 8 miles, then curves to the south-eastward for about the same distance to the south extreme of the reef, at about 11 miles S.W. by W. from the point, when it trends to the E.N.E. 8 miles, and round the reefs forming the western boundary of the Sluge channel. The reefs consist of several banks, on the shoalest part of which there are 8 feet at low water.

The Outer reef is an extensive irregular bank, with 2 to 4 fathoms water, except on certain patches, which have depths varying from 9 to

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* Adapted to the Danish survey of 1877.

15 feet on them; at 4 miles in a south-east direction from the outer end there is a patch with 11 feet water on it, with 17 to 18 feet midway between this place and the outer edge of the reef. A mile to the west and south of the outer part of this reef there are 10 fathoms. Still farther to the northward there are other banks on which the sea breaks with westerly gales: such are the Knold with 6½, and the Veirs with nearly 5 fathoms at low water, reddish bottom.

Near the west extreme of Horn reefs a black buoy with white staff and two brooms, will be moored in the spring of 1878, in 5 fathoms water. The words *Horn Reefs* are painted in white letters on the buoy.

LIGHT-VESSEL.—It is proposed in 1878, to place outside the western point of Horn reefs a light-vessel in about 17 fathoms water, showing a *revolving* light with a *flash every thirty seconds.*

In thick and foggy weather a syren will give three powerful blasts in quick succession every two minutes.

BLAABJERG, a hill 100 feet high, about 12½ miles northward of Blaavand point, is an important landmark in this vicinity. It is the highest part of the coast, and when seen from the south appears with three hummocks, and from the north or north-west like the roof of a large house.

Lifeboat.—There is a lifeboat and rocket apparatus at Blaavand point.

DIRECTIONS.—When approaching the Horn reefs from the northward, keep in 18 fathoms water, in order to pass outside the reefs, near which there are 12 to 15 fathoms. By day, bearings of Blaabjerg will enable a vessel to ascertain her position. The quality of the soundings is important; if mixed with transparent white pebbles, the vessels will be close to the westward or southward of the reefs, and ought not to stand in to shoaler water. Particular attention should also be paid to the direction of the current, and if bound for Fanö, do not incline more to the southward and eastward than to be in 10 fathoms on rounding the exterior of the reefs.

To pass outside these reefs when coming from the southward, the vessel's position should be ascertained by bearings of the islands, particularly of Fanö, the south end of which may be known by its two beacons, the northern one being the highest (page 253). Farther to the northward, the beacons on the north end of the island will be seen, together with Fanö mills, and also Jerne church in Jutland, standing on a very elevated position, which in clear weather may be seen over the island of Fanö, 16 miles, in the vicinity of the Cancer shoal. Take care to allow for the set of the tide, and do not approach the southern edge of the reefs nearer than the depth of 10 fathoms, nor than 7 fathoms when rounding their north-western edge.

The light-vessel when in position will be the best guide for clearing Horn reefs.

SLUGE CHANNEL.—The southern entrance to this channel bears N.W. 6½ miles from the Fairway buoy of the Graa deep, and vessels desirous of passing inside the Horn reefs, should bear in mind that there are two channels divided by the inner reef. The West Sluge, or Nordman deep, is formed by three patches on the south, viz.; the Cancer, with 18 feet on it; the Knob, with 18 feet; and the Hiörnet, with 15 feet; lying between W.S.W. and S.W. by S., and between 4 and 4½ miles from Blaavand point, with the outer reefs to the westward; and by the Ulven spit and Bovberg knob, the latter with 7 to 12 feet over it, on the north. The Ulven spit shoals gradually, and may be approached by the lead.

The Ringkiöbings deep is formed by Bovberg knob and by the shoals from Blaavand point. Immediately to the westward of Bovberg there is a long shelf with 4 fathoms over it, and to the eastward of it in Ringkiöbings deep, there are several patches with 18 and 23 feet water, and in a few places a depth of 6 fathoms.

The shoals from Blaavand point extend 2 miles to the westward, and sweep round to the southward, terminating in a spit called the Ulven (Wolf), which extends out S.W. by W. ½ W. to the distance of 3½ miles, to 3 fathoms.

DIRECTIONS.—Approaching the Sluge channel from the northward, when abreast of Blaabjerg, at 4 to 5 miles off, in 8 to 9 fathoms water, the course alongshore is S.W. ½ S., keeping in the same depth or somewhat less; and in order not to come too near Bovberg knob, the lead should be quickly hove. On this course, when Blaavand point, which is about 50 feet high, bears E. ½ S., and the depth is 10 to 11 fathoms in the Western Sluge, steer S.E. by E. in order to pass between Bovberg knob and the Ulven on the one side, and the Hiörnet, Knob, and Cancer on the other side. The shallows along the east side of this channel are not so steep-to as on the west side. When Blaavand point bears N.N.E. ½ E. the vessel will be past the Cancer, and may proceed to the southward.

From abreast the Blaabjerg a vessel may coast along the shallows in 4 fathoms, by steering a south-westerly course until getting into 5 to 6 fathoms in Ringkiöbings deep. The hill Ringebjerg, not far from the shore, is about 9 miles to the southward of Blaabjerg, and when seen from the northward or southward, its north-west part appears the highest, and sloping towards the eastward; from abreast the Blaabjerg, it cannot be distinguished from the adjacent land farther south, and is not much higher. By cross bearings of this hill and Blaabjerg, it may be ascertained when the vessel is at the north end of the Ringkiöbings deep; and when there, keep along the shallow of Ulven spit, or Bovbergs knob, according to the direction of the wind. Do not keep more westerly in this deep than in

4 fathoms, as the east side of Bovberg knob is steep-to, whereas along the shore it gradually shoals up to 3 fathoms. The depth in this channel is irregular, with 5 or 6 fathoms, and some patches with 3½ fathoms, as mentioned above. Having advanced so far that the depth increases to 11 fathoms and more, the vessel will be in the Sluge, and should steer S.E. by E. between the Cancer and the shallow from the shore, until Blaavand point bears N.N.E. ½ E. as before.

To enter Ringkiöbings deep from the southward, the vessel's position should be ascertained from Blaavand point, which, together with Oxby church, may be seen about 8 miles in clear weather. The most remarkable sand-downs are Dafsted and Krog sands, being higher than the rest, and with steep sides towards the east and west. When Blaavand point bears about N.N.E., steer N.W. by W. along the Ulven in 3 to 5 fathoms water, until the point bears E.N.E.; then steer N.N.E., which is the course nearly through the Ringkiöbings channel, keeping the lead going. When the channel is cleared by cross bearings of Blaabjerg and Ringebjerg and being in 6 to 7 fathoms water, keep N.E. by N. along shore, until abreast of Blaabjerg, and from hence shape a course as convenient.

To enter the Sluge or Nordman deep from the southward, stand towards the shallow to the southward of Blaavand point, and then keep along it until in deep water in the Sluge channel, when the course will be N.W. by W. till past the Bovberg knob, and then more northerly according to the vessel's position.

Besides by the N.N.E. ½ E. bearing of Blaavand point, a vessel will be also clear of the Horn reefs to the southward, when Benet beacon pole, on the shore, bears E.N.E.

TIDES.—It is high water, full and change, at Blaavand point, at 1h. 44m.; but outside on the reef it is said to be at noon. The mean spring rise is 7 feet, and neaps 5 feet; but it is greatly influenced by the state of the weather; thus, gales from seaward produce a higher tide, and the contrary when they blow off shore. On the Horn reefs, and to the northward and southward, between Nyminde Gab and Skallingen peninsula, a regular tide exists, changing every six hours, though much influenced by the direction and force of the wind.

With gales from N,W. and North, the stream of flood runs longer and with greater velocity, and this with S.E. and South gales, is likewise the case with the ebb. The flood runs to the southward, and the ebb to the northward, through the channels across the reef, and generally at the rate of one or 1½ knots. The stream follows the trend of the shore, and accordingly to the southward of Blaavand point the flood runs S.S.E. and the ebb N.N.W.

CHAPTER IX.

HORN REEFS TO THE SKAW OR SKAGEN.

VARIATION, 1878.

Blaavand point 14° 46′ W. | Skaw or Skagen 13° 30′ W.
Decreasing about 10′ annually.

ASPECT of COAST.—The coast between Blaavand point (50 feet high forming the western elbow of Jutland) and the Skaw is iron-bound, without harbours or refuges, and consequently should be avoided with all winds not blowing off shore. Along the coast a bank extends, consisting partly of three ridges, but between Blaavand point and the Haanstholmen, of two, and in some places of only one ridge, all of very compact sand, with occasional stones, and lying parallel to the coast, at nearly equal distances from it and from each other. The few shipping places there, are chosen in the least hazardous parts, where the distance of the ridges from the coast, and from each other, together with the depth over the ridges, make embarkation practicable.

Lifeboats.*

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* Along the west coast of Jutland, where, from the want of harbours or places of refuge, so many vessels are shipwrecked, life-boats with rocket apparatus, or separately, have been established at the under-mentioned places :—

Fanö Rindley, life-boat and rocket.
Blaavand point, ditto. ditto.
Henne strand, rocket apparatus.
Nymindegab (ent.), life-boat and rocket.
Bierregaard, rocket apparatus.
Haurvig, ditto.
South Lynvig life-boat and rocket.
Söndervig rocket apparatus.
Vædersö Klit, life-boat and rocket.
Bjerrehuse rocket apparatus.
Tuskiar life-boat and rocket.
Ferring, rocket apparatus.
Flyvholm, life-boat and rocket.
Tybo Rön, rocket apparatus.
Aggar canal, life-boat.

West Agger, rocket apparatus.
Orum strand, ditto.
North Vorupöre, life-boat and rocket.
Klitmöller, ditto ditto.
Hanstholmen, ditto ditto.
Lild strand, ditto ditto.
Thorup strand, ditto ditto.
Slette strand, ditto ditto.
Blokhusene, ditto ditto.
Lökken, ditto ditto.
Lönstrup, ditto ditto.
Hirsthals, ditto ditto.
Tversted ditto ditto.
Kandestederne, ditto ditto.
Skaw, or Skagen ditto ditto.

See Admiralty chart, North sea, No. 3,182 *b*; scale $m = 0{\cdot}1$ of an inch; also Baltic sea, No. 2,842 *a*; scale $m = 0{\cdot}1$ of an inch.

The outer ridge is in general distant 3 to 4 cables from the beach, commonly with a depth of 18 feet; the next ridge, with 11 to 12 feet water, is a half to a cable's length inside the former, and between them there is a depth of 4 fathoms, and even more. In the summer season, the water-stand being always less than during the winter, the ridges draw nearer to the beach. In gales of wind from the sea the waves break across all, but less violently in such places where a flat extends to some distance outside, and in such places it might be practicable to vessels, caught on a lee shore, to bring up between the ridges, immediately after having passed the outer one, and thus having a chance, though a precarious one, of riding out the gale.

On account of this, large vessels well provided with ground tackle, and chain cables of sufficient length, should prefer anchoring outside the ridges, sufficiently far out to veer 100 to 150 fathoms of chain without being in the surf; by doing which, it is possible that the vessel might ride it out, even without cutting away her masts.

The flat-bottomed vessel, commonly used on this coast, is called a Skudder (a kind of smack). During the summer season these skudders anchor inside the shelves, and are hauled on shore when boisterous weather renders it necessary; for this reason the anchorage is chosen off such places where the shore is gradually sloping, as for instance between Skiveren and Asdal. When not able to ride out the gale, the hatches are battened down, and, with her broadside to the wind, the vessel is thrown ashore by the surf; but it is indispensably necessary to have a sufficiently strong hawser or cable made fast on shore, to prevent the vessel being carried off by the reflux of the surf.

This coast may be divided into two parts, that facing the North sea, from Blaavand point to Hanstholmen, and that facing the Skagerrak, from Hanstholmen to the Skagen, the north-west point of Jutland.

The shore between Ringkiöbing and Nissum fiords is of moderate height, and the churches are low, except that of Husby, and all of them have low turrets, and are difficult to distinguish on account of the sand-downs along the beach. The churches on Holmsland, in the north end of Ringkiöbing fiord, have small pyramidal towers. Among the objects on the sand-downs of Nyminde land is, on account of its form, the remarkable Lille Oles Bierg, in lat. 55° 59′ N., having a wide cleft, in the middle of which there is a small knoll; 7 miles farther south is the large farm-house of Bierregaard, which in clear weather is visible 8 miles off, and is therefore useful as a landmark in making the Nyminde, which at present is 4 miles to the southward of the farm.

But a still more important landmark for this part of the coast is Blaabjerg hill before mentioned, 100 feet high, distant 3½ miles to the southward of Nyminde Gab. To the north or north-west of the hill, it has the appearance of the upper part of the roof of a large house. From the westward it appears of some length, highest in the middle, with many hillocks on its southern part, and is more conspicuous at a distance than when near it; from the south-west it appears of an oblong form, with a pointed hillock on its highest part. When seen from a more southerly position it is visible above all the sand-downs, being the highest part of the coast, with three hummocks on its top inclining to the westward; but the hill has no bluish hue, as might be presumed from its name, Blaabjerg (blue mountain).

From Nyminde Gab the shore may be approached by the lead as far to the northward as Husby, abreast of which, at 12 miles off, the depth is 18 to 19 fathoms, and gradually decreasing towards the land. From about a mile to half a mile off shore the depth is 4 fathoms; but farther in there are ridges along the coast, from a half to 3 cables distant, the positions of which, however, are constantly changing.

ANCHORAGE.—Off Blaabjerg, vessels may find some shelter with off-shore winds from N.E. to S.S.W., according to the distance from the beach. In making this anchorage, bear in mind that the depth from 8 to 4 miles off gradually decreases towards the shore, and may be approached by the lead. From 4 miles to the southward of Blaabjerg to the Nyminde Gab there are 4 fathoms at a distance of three-quarters to 1½ miles from the beach; the outer ridge of sand is about a quarter to half a mile off, with a depth of 2 to 3 fathoms, and on the inner ridge, at one to 2 cables from the beach, there are generally 4 feet at low water.

RINGKIÖBING FIORD is an extensive lake separated from the North sea by a long narrow sandy ridge called Nyminde land, 16 to 20 miles in extent, which has been broken through at different times. The shoals in Ringkiöbing fiord are the Tolvtor with 5 to 5½ feet, the Lods ground with 4½ feet, the South Pampus with 4½ feet, and on the Knoll and the North Pampus there are 3 to 4 feet.

In consequence of the depth being only 3 to 4 feet on the Knoll and North Pampus, lighters are employed to carry part of the cargo across these shoals. The navigation in this fiord is so tortuous and intricate, that local knowledge is necessary, though the different channels are pointed out by poles. Nyminde Gab, the southern entrance to this fiord, has shifted considerably to the southward of late years. In 1840 it was in lat. 55° 47½′ N.

The bar is distant about 3 cables from the beach, and the usual depth is 5½ feet on its shoalest part; the leading mark for the inlet is the beacons in line, and 4 small buoys point out the channel.

DIRECTIONS.—A vessel unacquainted with the localities, should ascertain her position by the objects to the northward or southward of

Nyminde Gab, and then keep along the coast, until she makes Blaabjerg or Bierregaard farm. To the N.W. of the inlet the soundings are 10 to 16 fathoms, with reddish pebbles and patches of white sand; and in the same direction, 11 to 16 miles off, there are banks with 7 to 9 fathoms water, and a similar reddish bottom from as far south as the Horn reefs; these soundings, therefore, may afford some information and guidance. By cross bearings of Blaabjerg and Bierregaard, a course may be shaped for the inlet, and in 5 to 7 fathoms, at 2 miles from the shore, the beacons consisting of poles, with black boards, may probably be seen. The water shoals gradually, and the vessel may stand in, by the lead, according to the weather. It requires a flood tide to enter, though the stream is not too strong for a vessel to stem, when favoured by a gentle breeze.*

TIDES.—It is high water, full and change, in the Nyminde Gab at 2h. 45m.; the average rise is about 2½ feet. Westerly winds cause a greater rise, and with a succession of gales from that quarter a current is continually running in; the contrary is the case when easterly winds prevail.

Telegraph.—A telegraph cable connects Sondervig near Rinkiöbing with Newbiggin to the north of Newcastle in England.

The COAST southward of Fialtring is low, with sand-downs; Nissum fiord is only separated from the sea by a narrow, low, sandy, ridge of land, through which breaks the mouth of the Thorseminde fiord. Between Fialtring and Harboöre the shore is fertile and of moderate height, with no sand-downs. The most conspicuous part of the coast is the hill of Bovberg, 197 feet high, near Trans, 14 to 15 miles to the southward of the Agger Minde, for making which, when coming from southward, the hill is a good landmark; and is the more easily distinguished by a pillar erected on its summit, and by its being so steep towards the sea as to be excavated by it. Abreast of this headland, at the distance of a mile, the depth is 7 to 8 fathoms, and as far out as 10 fathoms the bottom is clean sand.

The low neck of sandy downs which separates the North sea from the Liim fiord stretches about 9 miles to the southward of Agger Minde; and, owing to the refraction, the waters of the fiord are sometimes visible at a considerable distance out to seaward, while the low land of the coast is yet below the horizon.

LIGHT.—On Bovberg at about 12 miles south of Thybo Rön is a red brick tower, from which is exhibited at an elevation of 202 feet above the sea, a *fixed* white light, visible in clear weather from a distance of 20 miles.

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* The pilot station at Nyminde Gab was abolished by the Danish Government on the 1st January 1878.

NISSUM FIORD.—The entrance to Nissum fiord is pointed out from seaward by Bövling church, with a steeple somewhat like that of a mosque, to the northward of the entrance, while to the southward of it stands Husby church, with a steeple and pyramidal gable. The houses on this neck of land to the northward of Thorsminde, and farther in along the shores of the fiord, are the dwellings of the North sea fishermen.

LIIM FIORD, an extensive lake of an irregular figure, insulates the northern portion of Jutland. On its banks lie the towns of Lemvig, Nykiöbing, Lögstör, Nibe, Aalborg, and which by means of the navigation opened between the North sea and the Kattegat, partake of the advantage of sea-borne commerce.*

THYBO RÖN.—The Agger channel, the entrance to Liim fiord from the North sea, was formed in 1825 by the sea bursting through the isthmus about 3 miles southward of Blokkenbierg hill. This channel then carried 5¼ feet, it closed in 1868, and a new one opened, near Thybo Rön about 2½ miles south, but no vessel should attempt it without a pilot.

About one mile west of Thybo Rön channel entrance, a black buoy is to be placed in the spring of 1878, with white staff and three brooms. The words *Thybo Rön canal* are painted in white letters on the buoy.

LIGHT-VESSEL.—At the inner part of this new channel, a light-vessel, painted black, is moored, which exhibits, between the 20th of March and the 15th November, a *fixed* light from a height of 30 feet, which in clear weather is visible 9 miles.

PILOTS are stationed on board the light-vessel; and provided that it is possible to pass through the surf on the ridges, a pilot attends when the signal is made.

DIRECTIONS.—Two wooden beacons have been erected on the northern spit of Thybo Rön channel; in entering the channel these must be kept in line. On the inner or higher beacon is a flagstaff on which the signals for crossing the bar are given as follows:—If the depth of water will permit a vessel entering, and if the channel is navigable, a large blue flag will be shown, which will be hoisted and lowered as many times as there is depth of water in feet over the bar. If the depth of water be insufficient or if the channel be unnavigable, the flag remains stationary.

On the outer or smaller beacon is likewise a flagstaff with blue flag, by which the vessel's course is directed. If the flag be vertical the vessel has to keep the course she is steering, but if the flag be moved to one side or the other, the vessel must keep to the side towards which the flag is inclined; these directions should be received with caution, as the channel is so liable to change.

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* *See* Admiralty plan of Liim fiord, No. 2,325; scale, $m = 0\cdot 6$ inch.

TIDES.—Outside the mouth of the fiord the ebb runs S.W., and the flood North and N.E., being quite contrary to its direction farther out. During settled weather there is a regular tide in the mouth of the fiord, but, when an easterly wind sets in after a continuance of westerly gales the ebb may run out for a couple of successive days, until the common water-stand is settled, when the tide again makes regularly and changes every six hours. The contrary is the case when westerly winds set in after a continuance of easterly ones. During a gale the tide may attain a velocity of 8 knots. It is high water, full and change, at Agger Minde, at 4h. 9m. a.m.; and the rise is 2 to 3 feet.

Comparisons with former surveys lead to the supposition that the water-stand in Liim fiord, in general, has decreased about 3 feet during the last 160 years.

ANCHORAGE.—In the bay at Krik in Liim fiord there is good anchorage, better sheltered and not exposed to the violent tide or current in the mouth of the fiord. In taking this anchorage a vessel should be careful to avoid the bank or flat, which is steep-to, but well marked by broom beacons, extending to the eastward from Flegbusken. Along the east side there are rocks in 8 or 9 feet water at one to 1½ cables from the beach, near the cliff. Anchor in 9 to 12 feet water, good holding ground, at one to 2 cables from the beach, a little eastward of Krik point.*

NISSUM BREDNING.—To the southward of the narrows there are 15 to 24 feet water in Nissum Bredning and Lemvig fiord. The bank or flat along the west side of the Bredning, a dry shoal, is steep-to from 10 feet; Vestervig church in one with Kiœrgaard hill, leads well clear of the bank. The shore along the eastern side may be approached by the lead, but a vessel should not stand too near, abreast of Helligsö and Katterup, on account of some large rocks lying from one to 2 cables off.

In the southern part of the Bredning, near the inlet to the small town of Lemvig, there are some dangerous shoals, of which the north-easternmost, the Rönnen, consists of sand and rocks, with its south end barely covered. It is beaconed and lies E.S.E. ½ E. 1¼ miles from Geller point, and two-thirds of a mile to the northward of the Nissum shore, extending N.N.E. two thirds of a mile, with only 3 feet water on it.

Buoy.—A beacon buoy marks the south-east point of a small shoal with only 6 feet water on it, off the entrance of Lemvig; from the buoy Hygum church bears W. by N., and Nissum church S.E. by S.

LEMVIG.—Vessels bound for Lemvig may stand across the flat extending from the north side of the Rönnen, in 8½ feet water, by keeping

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* As the Agger channel is now blocked up, it is probable corresponding changes may have taken place in the banks to the southward and eastward of Flegbusken.

Törring church in one with a conspicuous hill close to the southward of Dalgaard, until Lemvig mill is in one with the west side of Bierregaard, S.S.W. ½ W.; keep this mark on until Harboöre church is on with the north side of Geller point, when keep a little southerly, so as to bring the mill in one with the west side of Lem hills. On this mark a vessel will cross the flat that extends from Geller point in 10 to 12 feet water, then steer W. by S. until the mill is midway between the two inner points in the fiord, when S. by W. ½ W. will lead direct for the mill, in mid-channel, in 12 to 15 feet water. Anchor abreast of the town in 9 feet, soft bottom with seaweed, at one to 2 cables from the beach.

If coming from the eastward to Lemvig southward of the Rönnen, steer a little to the southward of West, with Törring church in one with a remarkable cleft in the cliff, and also in one with a low hummock to the southward of a farm called Sögaard. Keep these marks on until Harboöre church is in one with the northern extremity of Geller point, when a vessel will be close to the south point of the Rönnen, which is steep-to, and from thence steer a point more northerly, so as to bring Törring church in one with Sögaard; until Lemvig mill is open of Lem hills, then follow the directions stated above. When working, a vessel must not stand nearer to the west side of Rönnen shoal than to keep Kabbelgaard fully open of the hill on which Kabbel mill stands.

To the northward of Geller point there is a small inlet with 12 feet water, in a W.N.W. direction, abreast of Hygum point, where shelter is found even against northerly winds, by the spit extending from Harboöre with a depth on it of only 2 to 5 feet, which forms the north side of the anchorage.

ODDE SOUND.—Along the shore off Nissum the bank is steep, with 9 to 12 feet water close to the beach; but on account of some small rocky patches with 6 to 7 feet water, outside the bank, vessels in working along shore should not go nearer than to have Hygum church in one with Nissum point. The course from the new channel across the Bredning is S.S.E. and S.E. by S. towards Odde sound (commonly called Otte sound), through which it is N.E. by N. with Söndbierg church midway between both points. The depth in the sound is 5 to 9 fathoms, and the banks are steep-to, particularly on the south side at Grisetaa point, which may be rounded closely. Vessels may anchor S.W. of the northern Ferry point, off which there is a flat.

VENÖ SOUND.—From Odde sound a vessel may proceed through Venö sound to the westward of Venö, to the shipping-place Struer. The depth in Venö sound is 3 to 3½ fathoms, and the bank is clean on both sides so as to be approached by the lead, except on the flat from the north-west point of Venö island, which is rocky. When working do not stand nearer this point than to have Hindsels farm, on Thyholm, standing close to the beach to the northward of Jegindö, and conspicuous by its broad red-tiled roof, just seen between the two points of Jegindö sound.

The course through Venö sound is South, towards Venö point, which should be passed close in 5 to 6 fathoms water, in order to avoid a long, narrow, and shallow neck of sand extending from Askær, the opposite point, nearly to the middle of the channel, which is very narrow. From Venö point the course is W.S.W. into Struer bay, until a conspicuous hillock, with a hollow in the middle, is in one with the north-easternmost house in the village, on which mark steer S.S.W. ½ W. close to the westward of a neck of sand with seaweed off Vrald point, which is steep from 10 feet. The anchorage at Struer is one to 2 cables from the beach, in 9 to 11 feet water.

VENÖ BAY is everywhere clean, with a depth of 3 to 4 fathoms, soft bottom, and shoals gradually to the beach. Close to the westward of the rivulet, off Handbierg, vessels may anchor in 2 fathoms water, at 2 cables from the shore; but north and north-westerly winds, blowing right on, produce rather a rough sea. In entering Venö bay from the northward, and passing to the eastward of the island, attention is required in order to avoid a sandy neck extending in an easterly direction to a distance of half a mile from Bradser point. Bring Hvidbierg church in the island of Morsö in one with the outer steep cliff of Kaas head until Veibierg mill is in one with Thors point, and on this mark steer about S. ½ W. into the bay, to the eastward of the sandy neck. Along the east side from Kaas head and to the southward of it, there are rocks near the beach on the bank. The port of Struer has been excavated to a depth of 8 feet, and a new port has been dredged out to the eastward of the old one and double its dimensions.

PASSAGE WEST of MORSÖ.—Vessels from the westward and bound to Thisted should steer E.N.E. ½ E. from Odde sound, past Louberg point, until Hindsels farm house is visible midway between both of the points of Jegindö sound; keep that mark on N. ⅓ E. in mid-channel into the sound, in a depth of 2½ to 3 fathoms until past the points which are steep-to; from thence the course will be N. by W. ¼ W., until past Skalmer point, being the westernmost point of Jegindö, and then N.N.E. ½ E., with Glomstrup mill just in one with the point to the northward of Hindsels, keeping in mid-channel, where the depth is 15 feet, until past Bastholm point, when the course is N.E. by E. ½ E. to the southward of Fuglholm a small islet abreast of Hindsels.

Jegindtap spit.—Vessels passing to the southward and eastward of Jegindö should avoid the spit (which has a beacon on it), extending from

Jegindtap point, which is rocky and steep-to on its south-east side. The mark to clear the south end of this spit in 10 feet water is Nörre Nissum church just open of Louberg point; and when on this mark, and the farm of Kaas and a mill of the same name are in one, a vessel will be abreast of the south-eastern end of the spit, and may steer N.N.E. across Kaas Bredning, until Heltborg church is visible midway between Agerö Bakke, a hillock, and Munkholm point.

On this latter mark steer N.N.W. ¼ W. between Böel point (off which are rocks a cable's length from the point) and Hester point, until so far advanced that Hindsels mill is in one with the south side of the small islet abreast of Hindsels farm; then keep a little northerly so as to bring Heltborg church in one with the south end of Agerö Bakke or hillock, which mark leads close to the eastward of the neck, extending to the eastward from Munkholm point, and which at its extremity slopes abruptly from 3 to 12 feet; from thence the course is W. ½ N. and W. by N. to the southward of Agerö in 15 to 18 feet water, mid-channel, both sides being steep-to.

When the sound between Lindholm and Agerö islands is well open the course is N. by W. ¼ W. midway in the sound in 3 to 4 fathoms water, steep-to on the Lindholm side, but shoal along Agerö and the Steenklip. The latter mark must be followed until Glomstrup mill is well open to the northward of the small island Steenklip, when the course is W.N.W. and N. by E. to the southward of Næsöre point, which may be passed at half a cable in 12 feet water.

Næs Sound.—In the middle of the southern part of Næs sound there is a small detached shoal, with large rocks on its south end, with only 4 feet water, sloping suddenly to 12 feet. A vessel will pass to the southward of this shoal, by keeping Hvidbierg church in Morsö just open to the southward of Næsöre Bakke, or hillock; to the westward of it, with the farm Bodumbisgaard in one with the parsonage, which stands to the southward of the farm-house; and to the eastward of it when the apertures of a stable on the beach are shut to view; when on the shoalest part of this patch, in 4 feet water, these apertures are open. From this shoal the course is N. by E. ½ E. in 3 to 3½ fathoms water, keeping in mid-channel in the sound, until Bodum church and mill are in one, bearing S.W., which kept in line astern is the leading mark through the sound, clear of Futterup point, and across Visby Bredning, between the neck of sand extending from Maager point and a detached shoal off it.

VISBY BREDNING carries from 3 to 6 fathoms, and is deepest in its northern part towards Maager point. The bank from the shore consists of sand, and shoals gradually towards either side. In the northern part is the shoal, just mentioned, lying W.N.W. ½ W. five-sixths of a mile from Maager point, having 5 feet on its shoalest part, with Outrup church in one with the north end of Orndrup hillock, and Skyum church just open outside of Gudnæs cliff. When working to the westward of this shoal, and standing to the eastward, keep Skyum church shut in with the cliff, until so far to the northward that Outrup church is visible to the northward, and open of Maager point, when a vessel will be to the northward of the shoal, and may stand to the eastward in 5 to 6 fathoms water.

With Bodum church and mill in one, a vessel will pass to the eastward of the shoal, midway between it and the shoal extending from Maager point; the course is then E. by N. ¾ N. between Skyum Ore and Ravelkiær hage, then N.E. ½ E. in mid-channel through Vil sound, until past Örhale point, when a vessel should steer N. ⅔ E. through the narrows of the sound; the deep-water channel lies close along the Ferry hage, a point on the east side. The depth in Vil sound is from 4 to 9 fathoms, and both sides are steep-to.

When through the sound, the course is N.E. by E. ½ E. in 4 to 6 fathoms, past Smaalands hage, a neck of sand with rocks, which will be avoided by keeping the westernmost mill at Thisted open to the eastward of the point abreast of Varhöi, then steer N.E. ⅔ N. in the direction towards the town of Thisted.

THISTED HARBOUR is formed by a mole stretching E.S.E. and N.E. from the beach at the south end of the town. Close outside the mouth of the harbour, which is 34 feet wide, there are 10 to 12 feet water, chalk bottom. The harbour is entered to the eastward of a short neck of the bank extending from Spids point by keeping open a narrow lane in the eastern part of the town, and steering N.N.E. until the mouth opens, when the course into it is W. by N. Coming from the eastward a vessel may stand towards the bank from the shore, to the eastward of the town, in 10 feet water, by keeping the westernmost mill at Thisted in one with the church. Two pilots reside at Thisted.

LIGHT.—At the south pier Thisted there is a small *fixed red* light, exhibited on a pole, and which is visible for 2 miles.

Skibsted Fiord.—From the deep-water channel between Agerö and Munkholm point, a vessel may proceed to Skibsted fiord by steering westward, changing the course by degrees to the S.W. into a narrow creek with a depth of 10 to 12 feet, and farther in to 8 feet, close to the southward of Hundser point; when the channel trends N.W. Inside Odgaard hage, it is extremely narrow with a depth of 2 to 4 fathoms, while on either side the banks are steep-to and nearly dry. From thence towards the inner part of the fiord the depth decreases gradually, and abreast of the farm Skibsted there are only 4 to 5 feet water across the fiord.

ANCHORAGES.—In the bay between Agerö, and Morsö, vessels may anchor in 9 feet; also in Glomstrup creek in 10 feet. There is good anchorage on a clear sandy bottom on the flat off Karby, in the easternmost part of Visby Bredning; and also on the west side of Visby Bredning, abreast of the rivulet to the northward of Kiestrup, in 14 feet water, at 2 to 3 cables from the beach, where the bottom is also sand.

In the bay to the northward of Gudnæs head there is anchorage to the eastward of the mill, a cable from the beach, in 9 feet water. The bank from the shore should not be approached too near on its south and east sides as it is rocky.

Anchorage is found all along the shore in Dragstrup Vig in 4 to 6 fathoms, but in entering, the banks around Ravelkiæt hage should not be approached within a cable's length.

Vessels desirous to stop in Vil sound, may anchor in Rue Vig in 9 feet water, soft bottom, a cable to the southward of Roebusk point. On the west side of the sound small craft may stop at Fævig, where the bank is steep-to.

THISTED BREDNING.—The depth in this bredning varies from 3 to 7 fathoms, but is deepest in its western part in the direction of Vil sound. The shore may be approached by the lead, except off a neck of sand with 6 feet water and steep-to, extending in a N.W. direction from Skare point in Morsö. Vessels should keep Overgaard, a farm in Morsö, well open of the point on the south shore, to the westward of Salgierhöi; the house of Overgaard may be known by an adjacent windmill, the only one visible on this part of the island. In a small bay abreast of Gulderup there is anchorage in 12 feet water, at one to 2 cables from the beach. The port of Hoxer in front of the village of the same name is not practicable for vessels drawing 9 feet.

FEGGE SOUND, uniting Thisted and Lögstör Brednings, is in its narrowest part, between Fegge cliff and Sæbesholm, only two-thirds of a cable wide, with a depth of 4 to 10 fathoms, and the banks with 5 feet water along either side are steep-to. When coming from the westward, and bound through Fegge sound, the course after passing Skare hage is E. by S. in 3 to 4 fathoms water, until Öslös church comes just open of the cliff N.E. by E.; then keep mid-channel in the sound until you have passed the north of Fegge Rön, which shoal may be approached within 35 yards; then steer S.E. by E. ½ E. into Lögstör Bredning.

On approaching Fegge sound from the eastward, avoid a rocky spit extending in a S.S.W. direction 1¾ miles from Holm Tange, with 3 to 8 feet water, and called Holm Tange hage, which is passed in 10 feet water by keeping the southernmost point of Fegge cliff well open of the north end of the hillock at Skaregaard in Morsö, when a vessel may steer

N.W. by W. ½ W. midway between Arup church and mill, until on the leading mark for the sound. Vessels coasting along the east side of Morsö, and bound for Fegge sound, must be careful to avoid a reef, with 3 to 6 feet water, extending in an easterly direction from Fegge Rön ; Skaarup hill in one with Öslös church will lead to the eastward of this reef, and when Arup mill is well open to the northward of Fegge Rön, a vessel will be to the northward of it ; then steer N.W. to the northward of the shoal, and afterwards S.W. by W. through the sound on the above mark, Öslös church just open of the cliff.

Anchorage.—To the north and west of a black beacon with a broom in 8 feet water, there is anchorage for vessels drawing 9 feet, on the sand E.N.E. of the mole-head at the north extremity of the flat which extends from Sœbesholm.

LÖGSTÖR BREDNING carries 3½ to 4 fathoms, with soft bottom, gradually shoaling to the northward towards the bight of Bygholms Veile, and to the eastward towards Lögstör bar, which consists of sand. Between Lögstör and Livö Brednings there are several shoals ; on the northernmost is the Rön, a small islet, distant a mile from the beach abreast of Eierslöv hillock in Morsö, and separated from that island by a passage with 3½ fathoms of water. The north side of the Rön is steep-to but from its south end the rocky reef extends more than a mile to the southward, having on it 3 to 5 feet water.

At 1⅓ miles E. by S. from the Rön, there is a sand-bank with 8 feet water on its shoalest part, with the house of Biörnsholm just open to the northward of Livö. Another shoal, the Blinde Rön, has a knoll consisting of sand and stones, dry at low water : this patch lies between the north-west point of Livö and Eierslöv cliff, distant 1½ miles from Livö, with Seierslöv church in Morsö in line with the south end of the high and conspicuous Eierslöv cliff. This shoal has 2 fathoms close to its south side, but off its north end a reef extends 1⅔ miles to the northward, with only 3 to 8 feet water, at fully a mile from the dry spot.

DIRECTIONS.—Vessels, in working through Lögstör Bredning between the island of Livö and Fegge sound, ought not to stand more to the southward than to have the house of Biörnsholm well open to the westward of Rönberg point. Vessels coming from Lögstör bar, and bound for the town of Nykiöbing in Morsö, should steer W.S.W. across Lögstör Bredning, to the northward of the island of Livö, the north side of which may be approached by the lead, and then S.W. by W. mid-channel in 4 to 5 fathoms water, to the southward of the Blinde Rön, with the high land in Morsö over Salling sound just shut in with Knuds head in the island of Fuur, until having passed the Rön ; then keep a point more westerly, in order to pass outside the shoal extending from Knuds head, until Salling sound is well open bearing S.W. by S., then keep it so, and steer towards Ör point in 4 to 6 fathoms water.

The bank from Morsö, close to the northward of this point, being steep-to, as it suddenly deepens from 6 feet to 4 fathoms, and it being in places also rocky, vessels working ought not to stand nearer to that part of the island of Morsö than to have the southern extremity of Ör point just shut in with Glyngör point in Salling sound. Having passed Ör point, the course is N. by E. into Nykiöbing bay through a narrow passage with 7 to 12 feet, the deepest water being along its east side, until farther in abreast of the town, where small craft may anchor in 8 to 9 feet water, soft bottom.

Vessels coming from the westward and bound for Nykiöbing, after having passed Jegindtap point, *see* p. 270, should steer E.N.E. across Kaas Bredning in 3½ to 4 fathoms water, until abreast of Sillerslöv point in Morsö, and then N.E. ½ E. through Salling sound in 6 to 10 fathoms towards the entrance to Nykiöbing bay.

KAAS BREDNING has a depth of 3½ to 4 fathoms: the bank along the shore from Hester point to Sillerslöv point is of small extent and consists of sand, but along the south side, round the point abreast of Kaas wood, it extends off, half a mile. Around the point it is rocky, but to the eastward, in the bay abreast of Aalbek mill, is a clean sandy bottom, with anchorage on the flat in 12 feet water, at 2 cables from the beach. Vessels do not ride safely with gales of wind from N.E. round by north to N.W.

Between Aalbek mill and Ny (New) mill, the bank shelves suddenly, with rocks near the beach under the high land; but off Ny mill there is a clean sandy flat with anchorage in 7 to 9 feet water. Harre Vig is clean, with a depth of 3 to 2½ fathoms in the innermost part of the creek. The course into it is E.S.E. midway between the points, taking care to avoid a short rocky reef from the projecting point on the south side of the creek, by hugging the north side, which is clean, and when having passed the reef steer E. by S. between the points, inside of which there is anchorage in any part.

SALLING SOUND has from 6 to 10 fathoms water, and to the northward of Glyngör point the depth is more than 16 fathoms. The shore is steep-to on either side. However, when working, attention should be paid to avoid the rocky shoal from Vil point, close to the northward of Harre Vig; therefore, do not stand farther to the eastward than to have Nykiöbing church in one with a corn magazine, which stands to the eastward of Salling sound Ferryhouse on Morsö.

A harbour is being formed near Glyngör point for the mail steam-boats which go from there to Nykiöbing.

CURRENT.—With winds from S.E. round by east to North the current generally runs to the southward, whereas it runs to the northward through the sound with the winds from South round west to N.W., and is frequently too strong to allow a vessel to work through.

DRAABY VIG on the east side of Morsö affords good anchorage, sheltered against all winds except those from south, which raise a sea in the bay. Vessels making this anchorage from the eastward should avoid a spit of sand with 3 to 4 feet water, which juts to the southward for half a mile from Buxer point, but which is cleared to the southward in 3 fathoms, by keeping a small conspicuous hillock on the island of Fuur well open to the southward of Knuds head cliff. When Ör point is on with Glyngör point, a vessel will be abreast of the southern point of the spit, and should steer N.W. and then North in the direction of South Draaby church, and anchor abreast of Jörsby hage in the innermost part of the creek, in 9 to 12 feet water, soft bottom. The bank from the shore consists of sand and seaweed.

From Buxer point to the northward towards Fegge cliff, there are rocks on the bank along the high land of Morsö, particularly around Eierslöv point, and from it to the northward until abreast of the low land to the southward of Fegge cliff, where there is anchorage in 10 feet water, clean sandy bottom, 2 cables' lengths from the beach. Vessels coming from Nykiöbing or Salling sound, and bound through Fegge sound, should, from Ör point, steer N.E. by N. with Salling sound well open, until North Arup church is well open to the eastward of Fegge cliff, N. by E. ½ E., keeping that mark on until Skaarup hillock is in one with Öslös church, and then steer into the sound, page 273.

FUUR ISLAND.—Along the north side of Fuur island the bank has from 2 to 4 fathoms, at 3 to 4 cables from the beach, close to which there are large rocks; so that vessels turning through the Livö Bredning should not stand into less than 2 fathoms. On the shallow round Knuds head there are likewise some large rocks, which are cleared to the westward by keeping North Arup church just open to the eastward of Fegge cliff. In the small bay on the east side of the island, between Færker and Engelst points, is a clean sandy bottom and a gradually-shelving bank, on which vessels may anchor and be well sheltered against winds from North round by west to S.S.E.

The south-west side of the island is steep-to towards Fuur sound. The best anchorage off this island is in Pulse Vig, the small bay on the south side of the island between Degen point and the mill. To enter Fuur sound from the westward, and to stand into this anchorage, care must be taken to avoid a reef extending N.N.W. from Sæby point. To clear the reef and the bank from the shore, bring Refshammer hillocks on Morsö island in one with the south end of Ör point, and steer on this mark E. ¾ N. until Kieldgaad hill, to the northward of Selde church, comes in line with Degen point, which will lead into the sound, and the point may be passed at 35 to 70 yards, in a depth of 3 fathoms. Anchor in Pulse Vig at one to 2 cables from the beach, in 12 feet water, sand and soft bottom.

In the easternmost part of Fuur sound, mid-channel, and half a mile to the eastward of the mill, there is the Middel ground, a reef nearly dry with rocks on its west end, and steep-to, with shallow water to the eastward of it. To avoid this reef, which has a beacon on each end, steer from Pulse Vig E. ½ N. until past the ferry point, and from thence E.S.E. ¼ E. with Fuur mill just to the northward of the southernmost of two houses standing on the ferry point and thus passing to the southward of the shoal in 3 fathoms, through a narrow channel between the shoal and the bank from the Salling shore. If desirous to leave the sound by passing to the northward of the shoal, the course is N.E. from the ferry point, until the apertures in Fuur church tower are open, when steer E.S.E. out of the sound. The passage between Fuur and the island of Livö is called Favne deep, and has all through 4½ to 6 fathoms.

LIVÖ ISLAND.—A bank along the west side of Livö extends off half a mile and gradually slopes to deep water on the north side; off the cliff on the west side of the island there are rocks near the beach. From the east side the bank is narrow and steep-to; and in a small bay there is anchorage in 9 to 12 feet, stiff ground, at one to 2 cables from the beach, with Öslös church on with the easternmost point of the island.

At the south end of the island, from the end of the long and narrow spit, called Liv Tap, consisting of sand and pebbles, and dry at low water, a curved reef with a broom beacon on its extremity extends S.S.W. to S.S.E., with one to 2 feet water. A vessel will pass to the southward of this reef by keeping Fuur mill in one with the south-east point of the island of Fuur, and to the eastward of it, with the houses in Rönberg village just visible outside the high land. To the eastward of Livö there is a clear passage, with 4 fathoms water, and the bank from the east side of the island is steep-to, with rocks near the beach.

BIORNSHOLM BAY.—In this bay there is anchorage on the flat, abreast of the house and of the rivulet, in 9 to 12 feet water, sandy bottom. To the north of Trend mill a reef borders the shore; and there are some rocks near the beach round Ertbolle point.

Having passed Fuur sound and going to the southward to Skive or Hiarbæk, steer S. ½ E. to Sundsöre hage, on the east shore of Salling, the bank from which slopes suddenly from 4 to 10 feet depth at one to 2 cables from the beach. When turning, a shoal a mile in extent north and south, with 6 feet water on its shoalest part, should be avoided; it lies just in the track between Junget and Strandby, but a third nearer to the latter, with Fuur church in line with the north side of Salling shore. With Rönberg point in line with Ertbölle point a vessel will pass to the eastward of it in 12 feet.

RIISGAARD BREDNING carries 4 to 8 fathoms water, soft bottom. Off the north side of Rotholm, in the southern part of the Bredning, a reef, with one to 5 feet water, extends two-thirds of a mile to the N.N.W. and is steep on both sides. A vessel will pass to the north and eastward of this reef by keeping Junget church open to the northward of a conspicuous pointed hill near the beach; and when the ferry-house at Sundsöre is well open to the southward of Great Rotholm, steer about S.W. When Grönninggaard house appears outside of the woody point of Astrup S.W. by W. ¾ W., keep it so, passing to the eastward of Sundsöre hage, which projects half a mile in a S.E. direction from the ferry-house, and is steep-to, having a depth of 6 fathoms close to the spit, on which there is a broom beacon, and but 4 feet water.

The above mark will carry a vessel in mid-channel into Hvalp sound, in 5 to 7 fathoms; the banks on either side being steep-to. If the above mark should not be visible, a conspicuous hillock, a short distance to the southward of the ferry-house, on the east side, should be kept just midway between Hesselgaard and a small house to the northward of it, which clears the spit of Sundsöre hage. The anchorage off Eskiær is abreast of the mill-stream or rivulet, at one cable from the beach, in from 9 to 12 feet water. On both sides of Sundsöre hage vessels may anchor according to the direction of the wind in 12 to 15 feet water, close to the beach. On the flat to the southward of the Riisgaard farms there is an anchorage in 12 feet water, sandy bottom, at 2 cables from the beach.

SKIVE FIORD.—Having passed Eskiær wood, steer S.W. into Skive fiord, close round Grönnig hage, which may be passed at about 35 yards, in 2 fathoms. In order to avoid the spit off Lundö hage on the outer extremity of which there is a beacon, extending N.W. by W. from the point, and suddenly sloping from 3 feet to 2 fathoms, a very conspicuous hill near the beach, S.E. from Tise church, should be brought in one with the outermost point of Grönning hage, this being the leading mark into Skive fiord, until near Krabbesholm wood, when the course is S. by W. ¾ W. along the bank from the shore, until at some distance to the southward of Krabbesholm; when a vessel may anchor at 1½ cables from the beach, in 6 to 7 feet water, soft bottom, abreast a small pier. On the bar of the river there is only 2½ feet water, and within it from 4 to 6 feet up to the village of Skive.

LAUNS or EAST BREDNING.—From Hvalp sound the course is S.E. between the projecting land of Lundö and Knuds head into the Eastern Bredning. From Jelse point a spit of sand, barely covered, projects 3 cables to the northward; its extremity falling suddenly from a foot to 3 fathoms. A flat-topped hill in Nörgaard fields brought in one with the woody point near them, clears the spit which is marked by a beacon with a cross; when the hill is well open of the woody point, it will lead to the southward of the shoal from Knuds head, round which are rocks a cable off, and which is also marked by a beacon.

In any part of East Bredning there are 3 to 3¼ fathoms water, soft bottom. The banks or flats along its shores may be approached by the lead, except the Trangmand sand, which extends out from the beach near the entrance of Virk sound, to the distance of a mile, and which, on its east side, is steep-to, deepening from 7 to 15 feet. From Knuds head the course across the East Bredning is S.E. by E. to the northward of the Trangmand, with Uldbierg church in one with a remarkable cleft in Uldbierg cliff to the northward of Klinthill, until the ferry-house at Virk sound is well open of the point on the west side of the sound, S. by W., which will lead into the sound.

Towards the narrows of Virk sound the depth increases to 4 and 4½ fathoms, and the banks on either side are steep-to, deepening from 4 to 12 feet water. In working in, do not stand nearer to Uldbierg cliff than to have Torup church in one with the middle of the ferry-house; and off the west side, tack when the ferry-house is shut in with Sundhagen point. Both points may be approached closely.

HIARBÆK FIORD.—The course from the ferry-point is S.S.W. ⅔ W. into Hiarbæk fiord, the banks of which are steep-to on the east side, and should not be approached nearer than to have Giedsted church in one with the east side of the ferry-house; the west side, from its shoaling gradually, may be approached by the lead. Farther to the southward in the fiord the depth decreases to 10 and 12 feet; having passed Örum church, the course changes gradually to south, and then S.E. ¾ S. until Vorde church is in one with a remarkable hollow or cleft in Vorde hill; this mark leads in 8 to 9 feet water to the eastward of a bank of sand, with 2 feet water, extending half a mile N.E. from Qvols hage, which is passed when the fourth hill from the southward of the Seiers hills is in one with the south-east end of Lynderup wood. On this mark steer S.W. by W. and anchor off Hiarbæk village a cable from the beach, in 8 to 9 feet water. In the southernmost part of the fiord, towards the mouth of Skals rivulet, there are 4 to 9 feet water, soft bottom.

Hiarbæk is connected with Viborg by a railway, of which place it is the port, and where the custom-house is.

The Current in Virk sound, as well as in Hvalp sound, runs at the rate of one to 2 knots; and during fresh N.W. winds, with still greater velocity, especially in the narrows of the sounds.

LÖGSTÖR.—Vessels coming from Hiarbæk or Skive and bound to Lögstör must avoid Lemdrup Rön, a rocky patch, just covered at low water, to the north-west of Lemdrup hills, and 4 cables from the beach. With Ornehöi house open to the northward of the town of Lögstör, a vessel will pass to the westward of it.

The bar, which extends 2 miles to the westward of Lögstör, and separates the deep-water sound inside of Lögstör from the Bredning, is, on account of its shallow water, only 3 to 5 feet, a great impediment to navigation between the western part of Liim fiord and the town of Aalborg. The bottom consists of loose sand, and consequently the channel is subject to frequent changes, particularly with westerly gales, rendering the services of a pilot indispensable.

Small vessels drawing more than 3½ feet cannot pass the bar without discharging part of their cargo into lighters; and when coming from the westward they are obliged to anchor outside the bar in 12 feet water, where, with westerly winds, they are exposed to much sea in the Bredning. The breadth of the bar is 3 cables, and the deepest channel across it is pointed out by a buoy with a red ball in 6 feet water to the north, and at 1½ cables to the south by a buoy with a small flag, with Naesborg church in one with the northernmost house to the northward of Smak mill.

From the last buoy steer E. by S. across the bar to southward of the inner buoy, which carries a broom and an arm on its top, and lies in 6 feet water inside the bar; the shoalest part of the bar being about half way between the two buoys, with Malle church in line with a hillock in Lemdrup field. Inside the bar there are two poles with brooms, standing on the north side of the passage; which leave to port, and steer Easterly until past the last beacon, and into the inlet of Lögstör, in 15 to 21 feet water, but the inlet is only a cable wide, and the banks on either side steep-to, and nearly dry. The impediment of the bar has been met by digging the Frederic VII. canal having in it a depth of 8 to 9 feet with a basin at each end with the same depth. The canal begins near and to the west of the town of Lögstör, follows the flat seashore, and ends near to the south of Lemdrup Rön. In the port there are 6 to 7 feet water, and along the north side of the town there are quays and several places for boats. The best anchorage is mid-channel, with a hawser fast to the shore to prevent the anchor getting foul. A ferry puts Lögstör in communication with Fœrge islands and Aggersborg. At 2 miles to the eastward of Lögstör there is another ferry across Agger sound, where there is a quay for a steam-boat, and 7 feet water.

The Current at times runs 2 to 3 knots; during continued gales from the eastward it runs to the westward, and during westerly winds in a contrary direction. The water-stand at Lögstör depends on the wind; during a continuance of settled weather, a regular ebb and flood is perceptible, though the rise of the water is very small, and the current does not change its direction.

AGGER SOUND.—The course through the narrow and deep sound to the eastward of Lögstör takes an easterly direction. The banks or flats along either side are steep-to as far as Agger sound farm; and at 1⅔ miles miles eastward the channel is marked by beacons. The track is to the southward of the middle ground and through the Hage deep, which is rendered narrow by a sand-bank, named Storkhals, that extends from the south side, and the Normandshage, a shoal barely covered on the north side, to the southward of Trelleholm.

On the north-west edge of Storkhals stands a pole, and one also on the south side of the Normandshage. When Vaar mill is in one with the west side of Vaar wood, a vessel will be at the spit of Storkhals in 10 feet water, and may steer S.E. by E. ¾ E. through the Hage deep, until Voxlev and Nibe churches are in one; then steer E. ¾ S. between the Mellemground holms on the north side and Vaar and Kyö holms on the south side, continuing eastward between the Skulehage on the south side, and the Olandhage on the north side, both of which are marked by poles, until at the Draget.

The Draget or Narrows carries 15 feet water, and is indicated by beacons on its south side. The westernmost beacon stands with Kokkedal mill on with the south side of a conspicuous hillock on the south end of Öland. Steer from this beacon through the Draget S.E. ¾ E., so as to leave the beacons to starboard. Having passed the last one, steer E.S.E. until Bislev church comes on with Koldsminde, a large and conspicuous house at the southern end of the small town of Nibe; then steer N.E. by E. across the flat between Klitgaard and Öland in 7 feet water, until Oxholm church is visible to the northward of the easternmost mill at Öland, when the flat is passed, which is indicated by a red beacon with a ball.

Making the Draget from the eastward, do not stand more westerly than to have Bislev church in line with Koldsminde, and then steer S.W. by W. across the flat; and when Sönderholm church comes in one with the southernmost of the insulated farms to the southward of those called Klitgaard, steer on that mark N.W. ½ W. towards the easternmost beacon.

From Klitgaard, if bound to the eastward, steer N.E. by E., changing the course gradually to E. ¼ N., between Giöl and Nörholm, in 3 to 4 fathoms; keep along the gradually shoaling bank off Giöl, on account of Giöl hage, a bank extending from the south side nearly to mid-channel, and leaving a small passage to the southward of it. When Rödslet mill is in one with the house on Fruensholm a vessel will be at the western spit of Giöl hage in 10 feet water, and may keep E. by N. mid-channel in 4 to 6 fathoms close to the small holms off the south-east end of Giöl, until Giöl church is in line with Isbakkehl house; from thence the course is E.S.E., until arriving at the first beacon on the Dynen shoal.

NIBE BREDNING is to the eastward of an extensive flat with some islands on it. The depth is from 7 to 12 feet, the deepest water being on the eastern side. Vessels having passed through the Draget should steer about S.S.W. ¾ W., keeping Bislev church on with Koldsminde until Giöl church comes on with the western house, which has a red roof and is situated near the houses of the Klitgaard, then steer S.W. ½ S. through a small channel with 6 to 8 feet water, and anchor opposite the mole of Nibe. A pilot resides at Nibe.

The Dynen is a narrow shoal, barely covered, lying in mid-channel between Giöl and Egholm, with the main channel to the northward of it. The westernmost pole or beacon on the Dynen stands with Aaby church in line with the east end of Skeelslund, a small grove on the shore to the northward of Giöl: both the middle beacons, the one on the north side and the other on the south side of the shoal, stand with the southernmost of the three conspicuous hills of Vesterhöie in one with Nörholm church; besides these beacons there is another on the east end of the shoal.

Through the channel steer S.E. ¾ E. to the northward of the beacons, in 4 fathoms water, between the flats steep-to on both sides; from the last beacon steer S.S.E. and S.E. by S. mid-channel, to the southward of Egholm, in 4 fathoms water, until St. Budolphi church at Aalborg is on with the northernmost of two conspicuous hills to the eastward of Aalborg; keeping on this mark E.S.E., a vessel will pass to the southward of Egholmhage, which is steep-to, and may be discerned by the colour of the water; from hence steer E. by N. between Egholm and the shore, changing the course to the S.E. for Aalborg, through a deep and clear channel, with banks steep-to on either side.

Aalborg is connected with the Kattegat by the Lanoge Rak, a channel about 15 miles in length, which opens into the Kattegat at Hals by the Haa Dyb. It has a large trade in corn, but the harbour has filled up considerably, so that vessels drawing 10 feet water are obliged to be lightened before entering it.

The COAST.—Resuming the description of the coast from Thybo Rön, the estuary of Liim fiord, to Hanstholmen, the direction is about

N.E. for a distance of 27 miles, and consists chiefly of large sand-downs, which hide the land within them, except when seen from a vessel about 4 miles off. This land behind the sand-downs is, however, hilly, and amongst the most remarkable objects are, the Tornbakke, a conical hill, near the beach, and the Galgebierg hills, which, though distant 7 miles from the beach, where the low ridge lies, show as eight different hummocks when abreast of them, some distance to the southward of Steenbierg. Another hill, Blokkenbierg, near the beach, is of a moderate height, but steep towards the beach, and may serve as a good guide when standing in for Thybo Rön: the large mansion of Vestervig Kloser may also serve the same purpose. Off Blokkenbierg, 6½ miles northward of the Thybo Rön, there are 4 fathoms water at only a cable from the beach, and from thence the coast southward trends nearly S.S.W.

About 6 miles from Hanstholmen, is Klitmoller. Abreast of it and 4 miles to the southward, is a clean sandy bottom, with a depth of 4 fathoms at the distance of 4 cables from the beach. If obliged to anchor here, the best spot would be with a conspicuous farmhouse, standing in an elevated situation on a cluster of hummocks called the Svale hills, bearing S. ½ W.

Life-boat.—There is a life-boat and rocket apparatus stationed at Vester Agger, 5 miles to the north of Thybo Rön.

HANSTHOLMEN POINT appears like several hummocks or islands. The remarkable objects on Hanstholmen are the church, without any turret; the lighthouse, 62 feet high, and 80 yards from the church; and some farm-houses, named Hedegaarde, in an elevated situation, and equi-distant from each other. The north extreme point of Hanstholmen is called Roshage, and about 1½ miles south-eastward of it is Hiertbierg, 205 feet high. The bottom is rocky for some distance round Hanstholmen point.

LIGHT.—On Hanstholmen point, the north-west point of the coast of Jutland, is an octagonal tower 62 feet high, which exhibits at the height of 218 feet above the level of the sea a *revolving* white light; attaining its greatest brilliancy every *half minute*, and visible in clear weather from a distance of 20 miles.

Telegraph.—A signal station is established in connexion with the telegraph station at Hanstholmen; the station is 320 feet N.N.W. from the lighthouse.

Messages will be received and delivered from sunrise to sunset. The signals used are those of the *International Code;* vessels showing their numbers will have their names telegraphed gratis to the Exchange at

Copenhagen at noon. Messages are sent in the Danish language and letters.

Life-boat.—Hanstholmen point is a life-boat and rocket apparatus station.

BULBIERG BLUFF.—The coast from Hanstholmen point, which is rocky, trends eastward for nearly 14 miles to Bulbierg, forming the small bay of Vigsö, which affords anchorage in a convenient depth; at a mile off shore there are 4 fathoms. This bluff promontory is about 360 feet high; it is excavated by the sea, and a part of it, the Skareklit, which is worn away from the cliff, is about 60 feet high, and lies 40 fathoms outside of the point. To the S.W. of Bulbierg stands Bierget mill on a hill, and surrounded by several houses; and behind is the remarkable high land of Kaase Knude, steep on its west side, and containing some villages and Hiardemaal church, with its high steeple.

BRAGERNE SHOALS.—N.W. and N.W. by N. from Bulbierg, more than a mile from the shore, there are two shoals, called the Bragerne, with 3 to 5 feet on their shoalest parts, and inside of them a narrow and crooked channel with a depth of 4 to 5 fathoms. To pass to the northward of them, the Hengelberg hills, two conspicuous hummocks on the Svinklöv sand-downs, together with a third and smaller one, should be visible to the northward of Bulbierg. If these hummocks are not visible, a vessel must not stand nearer to the shore than 4 miles, nor in a less depth than 9 or 10 fathoms.

To the N.N.E. ½ E., distant 8 miles from Bulbierg, lies a small bank, called the Vester Hog, with about 6½ fathoms on its shoalest part. The marks for which are Leerup church in one with Leerup valley, and Bierget mill, together with a conspicuous hill adjacent to the mill visible to the westward of Bulbierg, and close outside of Skareklit, a sandy cliff detached from Bulbierg.

JAMMER BAY.—From Bulbierg the shore continues to the eastward and northward for about 43 miles to Hirtshals point, forming the extensive bay of Jammer.

Anchorage.—To the eastward of Bulbierg, at 5 to 7 miles from the shore, with Thorup strand houses bearing S.S.W. ½ W., a vessel may anchor, with off-shore winds; and on this bearing 4 fathoms with gray sandy bottom will be found a mile from the beach. Small vessels may anchor in 3½ fathoms water, opposite the mouth of Lönstrups rivulet which is about 4 miles to the south-west of Hirtshals point. The bottom is here gray sand. Between Lökken and Hirtshals point the shore is rocky.

RÖDGROUND and BAKKEN BANKS.—From 10 to 11 miles to the westward of Hirtshals point, abreast of the high land of

Rubierg, are two shoal patches: the Rödground from one to 1¼ miles in extent, with a depth of 3½ fathoms, over rocky bottom, lies 3 miles from the shore, with the conspicuous church of Venneberg bearing S.E. ¼ E. The Bakken, with 3 fathoms on its shoalest part, lies with the same church S.E. by E. ½ E., distant 4½ miles from the shore. Saltum church in one with the inner side of the houses at Lökken leads inside the Rödground when coming from the northward, and Ingstrup church kept close outside of Lökken leads between the two shoals in 7 to 8 fathoms. Neither of these churches has a steeple.

Life-boats.—There are six life-boat stations with rocket apparatus in Jammer bay: at Thorupstrand, 9 miles to the eastward of Bulbierg; at Slettestrand, 6 miles more to the eastward; at Blokhusene, half-way between Bulbierg and Hirtshals point; at Lökken, 16 miles S.W. of Hirtshals point; at Lönstrup, 9 miles from the point; and at Hirtshals point.

HIRTSHALS POINT.—Off Hirtshals point a flat extends to the distance of about 6 miles, with several shallow spots on it, though none with less than 4 fathoms, and the innermost is only a mile from the point. A prudent distance for a large vessel to pass this point is about 10 miles.*

Besides the lighthouse and signal station the other remarkable objects on the shore near Hirtshals are: Löibierg a hill of moderate height flat on its upper part, on which stands Horne church and mill; and the high land of Rubierg, consisting of sand-hills, distant 10 miles south-westward of the point. It is rendered the more distinguishable by Venneberg church, to the westward of which is a small round hillock. To the southward of Rubierg stands the large mansion of the Börghum Kloster estate, with the church contiguous. Amongst the sand-downs on the shore, the Svinklöv is one of the most remarkable, being high, steep, and flat on the top.

LIGHT.—On Hirtshal point is a circular red tower 88 feet in height, from which is exhibited from an elevation of 187 feet a *fixed* and *flashing* light. The light is steady for 2 minutes and 55 seconds, then obscured for 27 seconds, a strong light for 11 seconds, and again obscured for 27 seconds, succeeded by the steady light, or a bright flash every 4 minutes; it is visible in clear weather 21 miles.

In 1878, it is proposed that during thick and foggy weather for a syren to give *two* powerful blasts in quick succession every *two minutes*.

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* *See* Admiralty chart, The Skagerrak or Sleeve, No. 2,289; scale m = 0·25 of an inch.

Telegraph.—A signal station in connection with the telegraph station is erected at 150 feet N.E. of the lighthouse, where messages are received and dispatched from sunrise to sunset. The signals are made by the *International Code*. Vessels which show their distinguishing signal on passing, will be reported each day at noon at the Exchange in Copenhagen without charge.

Messages ought to be given, and are sent in the Danish language and letters.

A telegraph cable connects Hirtshals point with Arendal in Norway, and Newbiggin on the north-east coast of England.

Tannis Bay Anchorage.—Between Hirtshals point and the Skaw is Tannis bay, where good shelter will be found with south-east and southerly winds. On either side of Hirtshals point the depths are irregular and the bottom foul. Abreast some houses called Kiul, 2 miles eastward of Hirtshals point, at one to 2 miles from the shore, there is anchorage in from 5 to 9 fathoms. Bring Hellehöie hills in line with Asdal, a mansion in an elevated position, and when in 9 fathoms keep the northernmost house in Kiul in one with Asdal; with the latter marks on and a mile from the shore, anchor in 5 fathoms, sheltered against winds from S.E. round south to S.W.

In the middle of Tannis bay, a vessel may anchor on Skag bank, a sandy bank 5 or 6 miles from the shore, in 9 or 10 fathoms; inside this bank the water is deeper. Abreast Gammel Skagen (Old Skaw) there are 10 to 12 fathoms at 1½ miles from the shore, over sandy bottom; a little further east the shore is steep-to.

Life-boat.—There is a life-boat and rocket station in the eastern part of Tannis bay, at about 7 miles from Skaw lighthouse.

SOUNDINGS.—As indicated in the chart, soundings may be obtained until nearly in the middle of the Skagerrak; in the offing mud and ooze, and towards the coast of Jutland fine sand, whereas towards the coast of Norway the depths are from 100 to 250 fathoms, which continues to deepen on the south-east coast; these soundings accordingly afford good guidance during foggy or thick weather.

The depth gradually decreases on approaching the shore of Jutland, except abreast Hirtshals point, where the 20-fathoms line curves, forming a plateau at 17 to 22 miles to the north-west and northward from the point, with 16 to 20 fathoms water on it, inside of which there is as much as 30 fathoms, the plateau is joined by a neck with 16 fathoms on it to the bank off the coast, which, at a distance of 7 or 8 miles, runs eastward close to the Skaw.

TIDES.—It is high water, full and change, at the Skaw, at 5h. 56m., and at Hirtshals point 4h. 28m., but the rise and fall is scarcely one foot.

In Tannis and Jammer bays the rise of the water is small and the current near the shore follows the direction of the wind; but farther out in deep water it commonly runs in an E.N.E. direction, except in easterly gales, when it occasionally runs to the westward.

THE SKAW or SKAGEN.—The north point of Jutland, at the junction of the North sea with the Baltic, is the turning point of one of the principal high roads of commerce, and is passed during a year by about 70,000 vessels. Near the point stands the village of Skagen, consisting of three divisions, the East-town, West-town, and Old Skagen. To the eastward of these rises the old lighthouse of Skaw, which is sheltered from the westward by a sand-hill of 140 feet in length, and 40 feet wide.*

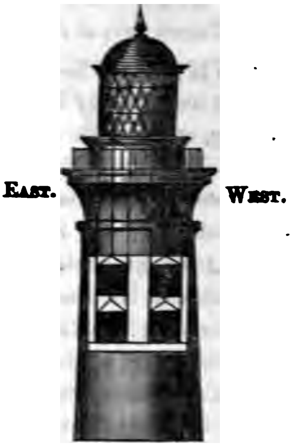
LIGHT.—The new light-tower on the Skaw stands E. by N., 1,700 yards from the old lighthouse, is circular, built of red brick, and 126 feet in height; it exhibits, at 144 feet above the mean level of the sea, a *fixed* white light, illuminating with its greatest brilliancy, between the bearings of E. by N. through south to N.E. by N. A fainter light is shown over the land and through the remaining points of the compass. In clear weather, the principal light is visible from a distance of 18 miles; and the faint light 12 miles.

LIGHT-VESSEL.—It is proposed in 1878 to place a light-vessel one mile north-east of Skaw spit buoy. The vessel will be moored in 20 fathoms water, with the spit buoy in line with Skaw lighthouse.

Also in thick and foggy weather a syren will give *one* blast every *two minutes*.

ICE-SIGNALS.—When the state of the ice at the stations of Vinga-Skærgaard, Elsinore, Sæby, and of Frederikshavn is such as to impede the navigation at those stations, the following signals will be shown, by means of black tables, hung out beneath the gallery on the white painted surface on the northern side of the new lighthouse of Skaw:—

Signal apparatus on the Skaw lighthouse.



The new lighthouse of Skaw, seen from the North.

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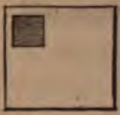
* It has been proposed to build a harbour of refuge abreast of the old lighthouse.

No. 1.



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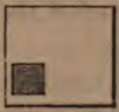

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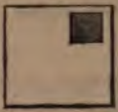

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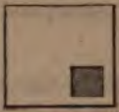

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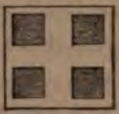

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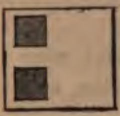

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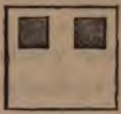

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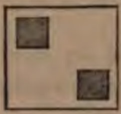

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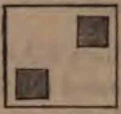

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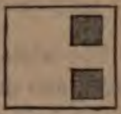

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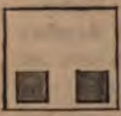

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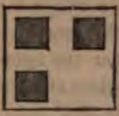

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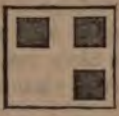
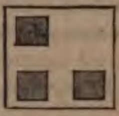


No. 14.



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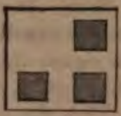


No. 1. Ice in Vinga Skægaard preventing the navigation.

No. 2. Ice at Elsinore prevents entering the harbour.

No. 3. Ice at Frederikshavn prevents entering the harbour.

No. 4. Ice in Læsö channel preventing the navigation.

No. 5. Ice in Vinga Skægaard, at Elsinore, at Frederikshavn, and in Læsö channel.

No. 6. Ice in Vinga Skærgaard and at Elsinore.

No. 7. Ice in Vinga Skærgaard and at Frederikshavn.

No. 8. Ice in Vinga Skærgaard and in Læsö channel.

No. 9. Ice at Elsinore and at Frederikshavn.

No. 10. Ice in Frederikshavn and in Læsö channel.

No. 11. Ice in Læsö channel and Elsinore.

No. 12. Ice in Vinga Skærgaard, at Elsinore, and at Frederikshavn.

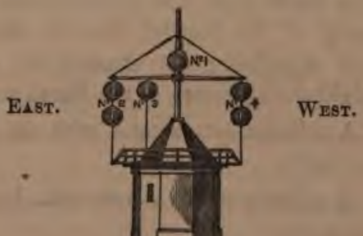
No. 13. Ice in Vinga Skærgaard, at Frederikshavn, and in Læsö channel.

No. 14. Ice in Vinga Skærgaard, at Elsinore, and in Læsö channel.

No. 15. Ice at Elsinore, at Frederikshavn, and in Læsö channel.

SIGNALS.—To indicate that one or more of the light-vessels in the Kattegat, either from the state of the ice, or from some other reason, have left their stations, the following signals will be shown during the time the vessel is away from her station :—

By Day.—On a mast, with a yard attached and raised on the top of the old lighthouse of Skaw which stands nearly a mile W. by S. from the new lighthouse.



The old lighthouse of Skaw, seen from the North.

1. A ball on the mast above the yard, *Trindelen* light-vessel is not in her station.

2. Two balls at the eastern yard arm, when the *Kobberground* light-vessel is not in her station.

3. A ball at the quarter of the eastern yard, *Knoben* light-vessel is not in her station.

4. Two balls at the western yard arm, when the *Læsö* channel light-vessel is not in her station.

By Night from an auxiliary light station on the northern side of the *new* lighthouse of Skaw, and 62 feet above the level of the sea, there will be exhibited :—

1. A *red* light when the *Læsö* channel light-vessel is not in her station.
2. A *green* light when the *Trindelen* light-vessel is not in her station.
3. A *white* light when the *Læsö* channel light-vessel, and the *Trundelen* light-vessel are not in their stations.

The white auxiliary light should be seen in clear weather about *nine* miles, and the coloured lights about *five* miles, in a northerly direction, and decreasing on both sides to about 60°.

NOTE.—In order to form a correct knowledge of the state of the ice in the Kattegat, the ball signals ought always to be compared with the table signals. When therefore the signals from the old lighthouse of Skaw indicate that the light-vessels have left their stations, it may be expected to meet ice whether the tables are shown or not.

When the auxiliary light shows a white or a *green* light, and consequently indicates thereby, that in both cases the *Trindelen* light-vessel has left her station, there will be a probability that the light-vessel of *Kobberground* has also been removed, the general rule being that this light-vessel is taken away earlier than the former. In this case the *Anholt-Knoben* light-vessel will probably have been removed from her station, and the auxiliary light on the lighthouse of Anholt will then be shown.

Further information concerning the state of the ice and of the light-vessels in the Kattegat may be obtained by exchanging signals with the semaphore at Skaw.

For ice in the Great Belt and in Aarhuus bay a white flag with a blue vertical stripe will be hoisted on the flag-staff at Forness lighthouse; and for ice in the northern part of the entrance to the Great Belt and in the fairway west of Hielm island, a similar flag on the flag-staff at Hielm lighthouse.

Weather Signals.—Signals are made at the mast-head by means of a black cone and cylinder, and remain hoisted for 36 hours after the receipt of the despatch from the Meteorological Institution at Christiana; they signalise great atmospheric disturbances that may threaten the neighbouring coasts, in the North sea, and in the Baltic.

A cylinder over a cone with the point down.—A gale threatened from the south.

A cylinder under a cone with the point up.—A gale threatened from the north.

A cylinder alone.—A gale, without indicating the direction.

The greater part of the gales in these seas commence from the south and generally veer to the west, they mostly blow with the greatest violence when the wind veers from N.W. to North.

PILOTS.—From the Skaw, pilots are to be had who are all able to bring ships to an anchor, or to conduct them to the Hirtsholms or to Fladstrand road. Likewise a pilot-boat from Frederikshavn beats about there, in order to furnish ships with pilots for Helsingör (Elsinore), Nyborg, and Fredericia, and a Swedish pilot-boat to supply pilots for the Skærgaard and the coast of Sweden, as well as for Arendal in Norway.

Telegraph.—A submarine cable is laid from the Skaw point to Marstrand island in Sweden. Two beacons have been erected to mark the position of the shore end, and the direction of the cable: the outer beacon stands S. 65° E. from the old lighthouse, and S. 61° W. of the new, and distant 30 yards from the shore, the east side of the beacon is red and the west side white, the inner beacon is N. by W., 207 feet from the outer, the east side of it is white and the west side red. The direction of the cable on the coast is S. by E.

SKAW SPIT.—The narrow neck of land between the lighthouse and the extreme point is named the Grenen, and consists of compact hard sand. From the point a spit extends E.N.E. 2 miles; it consists of a hard white sand, with stones thrown there occasionally from ships in ballast. From the extreme point of the spit, its eastern side takes a south-westerly direction until abreast the lighthouse, towards which it then trends, until it merges in the shoal water that extends about 3 to 3½ cables from the shore. The spit, on which there is a surf in blowing weather, forms a curve to the south-eastward, and does not appear to change in its direction or extent.

On the south side of the spit the depth gradually increases, so that the soundings are a good guide; whereas on the north side it is steep-to, and ought not to be approached within the depth of 12 fathoms, which suddenly shoals to 4 fathoms. During the day the edge of the spit is distinguished from aloft by the colour of the sand, which shows through the water.*

Beacons.—A large black and red chequered buoy carrying a red pole with a red ball is placed at the end of the spit, in 4½ fathoms, with the old lighthouse and the old church tower in one; but there can be no certain reliance upon its remaining in its place. This beacon buoy should be passed, in a large ship, at a distance of 1½ to 2 miles. Another beacon with two brooms is placed at the south-east extremity of the reef, in 4 fathoms, the old lighthouse bearing W.N.W., and the old tower West. This beacon and buoy remain in their places until carried away by the ice, when others are as soon as possible substituted for them.

CURRENT and ICE.—The direction of the current here is commonly W.S.W. with northerly and westerly winds, and E.N.E. with southerly and easterly winds. In gales of any of these winds it may attain a velocity of 4 knots, whereas with moderate weather it seldom runs faster than a knot. In easterly gales the ice is piled up on that part of the spit where there is less than one fathom water, and sometimes remains for a long time after the rest of the ice is gone.

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* Directions for Kattegat, Belts, &c. will be found in the *Danish Pilot*, 1854.

Anchorage.—With west and south-west winds, shelter will be found to the south-east of the Skaw, with the old lighthouse bearing about N. by W. in 8 or 9 fathoms, sandy bottom.

TIDE TABLE.

Showing the time of High Water, Full and Change, with the rise at Springs and Neaps above the mean Low Water level of ordinary Spring Tides, at the principal places on the Thames and Medway, and from cape Gris-nez to the Skaw or Skagen.

Place.	High Water, Full and Change.	Rise.	
		Springs.	Neaps.
	h. m.	ft.	ft.
The Nore, Thames -	0 30	15½	13
Gravesend, do. -	1 10	17½	14
Woolwich, do. -	1 37	18½	15½
Greenwich, do. -	1 43	19	15
London Docks, do. -	1 53	20¾	17¼
London Bridge, do. -	1 58	20¾	17¼
Sheerness, Medway -	0 37	16	13¼
Chatham, do. -	1 11	18	14½
——			
Cape Gris-nez -	11 27	21½	16¾
Calais - -	11 49	19½	15½
Gravelines - -	Noon	19	15
Dunkerque - -	11 55	16¾	13½
Nieuport - -	0 18	16	13
Ostende - -	0 25	17	13¼
Blankenberg -	0 15	18	10
Flushing Schelde -	0 54	15	11
Bath do. -	3 15	14	
Antwerp do. -	4 25	15	
Veere - -	1 0	15	11
West Kapelle -	0 40	14¾	11
De Roompot, E. Schelde.	1 0	15	11
Zierikzee, E. Schelde	2 0	10½	9
Brouwershaven gat -	1 0	9¼	7½
Brouwershaven -	2 0	10	8
Goeree gat* - -	2 0	7¼	
Hellevoitsluis -	2 30	5½	
Brielle, Maas -	3 0	5	
Rotterdam, do. -	3 45	7	
Katwyk - -	2 30	5	
Texel (outside shoals)	6 30	4	3½
Kykduin - -	7 0		
Nieuwe diep - -	7 27	4	
Terschelling island, west	8 40	6	
Ameland do. -	9 30	6¼	
Schiermonnikoog do. -	9 40	5¾	
Rottum do. -	10 0	7½	
Borkum do. west	10 30	7	
———— east	10 30	7	
Delfzÿl, Ems -	11 15	8½	
Emden, do. -	0 34	9	
Juist island - -	10 15	6½	
Norderney do. -	11 15	7¾	
Baltrum island -	11 20	8	
Langeroog do. -	11 25	8	
Spiekeroog do. -	11 30	8¼	
Neuharlinger siel -	11 45	5¾	
Frederiken do. -	11 55	4	3½
Wangeroog island -	11 35	10	
Hook siel, Jade -	Noon	11	
Heppens do. -	0 30	12¼	
Weser river, entrance	11 30	14	
Do. light-vessel	0 20	10	
Do. Hohe Weg light ho.	0 35	10½	
Do. Bremerhaven.	1 40	11	
Helgoland - -	11 33	9¼	
Elbe river, entrance	Noon	11	
Do. outer light vessel -	0 15	9½	
Do. Cuxhaven -	1 8	10	
Do. Brunsbüttel	1 58	9	
Do. Glückstadt	3 9	11½	
Do. Altona -	5 9	8	
Do. Hamburg -	5 29	7½	
Blauort sand, Norder piep - -	0 38	12	
Büsum - -	1 21	12	
Eider river, entrance	Noon	10	
Do. Tonning -	1 55	11½	
Do. Frederickstadt	2 37	9	
Husum, Hever river	2 20	11	
Pellworm - -	1 50	10	
Wyk, Föhr island -	1 50	8	
Amrum - -	0 30	9	
Lister-deep -	2 21	6½	
Do. road -	2 0	6½	
Söuderho, Fano island	2 22	5½	
Hjerting - -	2 45	4¾	
Blaavands Huk -	1 45	7	
Horn reefs -	Noon		
Nyminde Gab -	2 45	2½	
Thorsminde -	3 34	2	
Aggerminde -	4 9	2	
Hirtshals - -	4 28	1	
The Skaw or Skagen	5 56	1	

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* At Goeree gat the flood tide runs longer and rises higher with northerly and wes erly winds, while southerly and easterly winds equally affect the ebb, page 146.

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